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Voluntary environmental disclosure by Australian listed mineral mining companies: An application of global reporting initiative guidelines

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Voluntary Environmental Disclosure by Australian Listed Mineral Mining Companies: An Application of Global Reporting Initiative Guidelines

By



YANAN XIA

A Thesis Submitted in Partial Fulfilment of the Requirement for the Award of

Bachelor of Business (Accounting) Honours

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Edith Cowan University

Date of Submission: 8 July 2011

USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

ABSTRACT

There is a growing interest in studying voluntary environmental reporting around the world, especially in the mining industry, as there has been an increasingly focused debate about mining and its environmental responsibility, driven by strong public sentiment.

The objectives of this study were, firstly, to evaluate the changes in environmental reporting over the period 2007-2010, in terms of type and volume of information disclosed in the Australian mineral mining industry, using the 2006 Global Reporting Initiative (GRI) Guidelines and secondly, to identify the key political characteristics of companies that volunteer to disclose environmental information in their annual reports. Based on the political cost framework and the review of literature, five testable hypotheses were developed. These hypotheses were generated in terms of five explanatory variables, which were company size, rate of return on assets, effective tax return, market share and number of shareholders.

A sample of 100 Australian listed mineral mining companies was selected from the Fin Analysis database at Edith Cowan University. Within those companies, annual reports for the financial years 2007, 2008, 2009 and 2010 were reviewed. Content analysis was performed on each of the 400 annual reports. The GRI environmental index was used as a guideline to identify and classify the environmental disclosures provided by sampled companies. Further information regarding the organisational characteristic such as company size, rate of return, effective tax rate, market share was collected from the Fin Analysis Database, and information on the number of shareholders was collected from the companies' 2010 annual reports. To achieve the first objective, descriptive statistics and Wilcoxon signed-rank tests were used to analyse the changes in the level and type of environmental disclosure during 2007-2010. Furthermore, to achieve the second objective of the study, which was to identify the determinants of environmental reporting in terms of political cost framework, univariate statistics and ordinary least square multiple regression were conducted. All statistical results were generated using the Statistical Program for Social Science (SPSS).

The findings from the environmental reporting analysis indicated that an increasing number of Australian listed mineral mining companies were disclosing environmental information in their annual reports during 2007-2010. The relative volume of such

information disclosed in the annual reports also increased during this period. However, the level (extent of reporting) of environmental disclosure in the Australian mineral mining industry was typically low, as companies only disclosed a narrow group of reporting elements from the GRI environmental performance indicators. Moreover, the results from qualitative analysis indicated that the quality of environmental disclosures is relatively low. Finally, Australian listed mineral mining companies tend to disclose categories, such as “Overall”, “Energy”, “Water”, “Emissions, Effluents, and Waste” and “Products and Services”, which are the most common concerns raised by the public.

The findings from the multiple regression analysis indicated that certain variables from political cost theory are able to explain the level of voluntary environmental disclosure by Australian listed mineral mining companies in their annual reports, whilst other variables are less able to. Variables company size and effective tax rate are significant, and hence, are able to explain the level of voluntary environmental disclosure. The remaining three variables including rate of return on assets, market share, and number of shareholders are not found to be highly significant. Nevertheless, rate of return on assets and number of shareholders are moderately significant. Except for variable rate of return on assets, all variables were found to be in the expected direction.

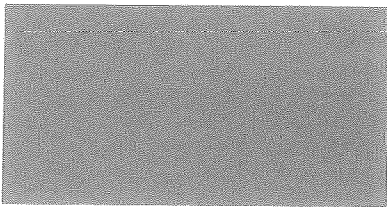
The findings of the study, subject to limitations, have implications for the users of annual reports, the preparers of annual reports, and the regulators of financial information in Australia.

DECLARATION

I certify that this thesis does not, to the best of my knowledge and belief:

- i. incorporate without acknowledge any material previously submitted for a degree or diploma in any institution of higher education;
- ii. contain any material previously published or written by another person except where due reference is made in the text; or
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Yanan Xia



Date: 8 July 2011

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CHAPTER 1

INTRODUCTION

Research Background

Society is increasingly calling for organisations to demonstrate corporate social responsibility, not only on their economic performance, but also on their environmental and social performance (Raar, 2002). Triple-bottom line reporting, which involves the reporting of economic, social and environmental performance, is a key step towards meeting society's demands for more corporate social responsibility (Silva, 2008).

Environmental reporting, as part of triple-bottom line reporting, has propagated substantially during the past few decades. Many recent studies have indicated that investors and stakeholders have become increasingly concerned about corporate environmental policies. Environmental disclosure can be perceived to be a response to external public pressures on corporate managers, who attempt to manage public image regarding environmental performance (Neu, Warsame & Pedwell, 1998).

As a result of external public pressures, many companies are voluntarily increasing the level of environmental disclosure in their annual report. Kolk (2004) acknowledged that since the first separate environmental reports was published in 1989, an increasing number of firms have started to provide information on their environmental, social or sustainability policies. However, incompleteness and incomparability of environmental reporting have also been identified by a number of studies. Perez and Sanchez (2009) revealed that there was considerable variation among mining companies in the types of environmental information provided in their sustainability reports.

Due to the topicality and controversy surrounding environmental and social issues around the Australian mining industry in recent years, there has been an increasingly focused debate about mining and its environmental responsibility, driven by strong public sentiment. Recent studies have indicated that environmental reporting in the mining industry is a growing worldwide trend ("Environmental problem", n.d.). However, Yongvanich and Guthrie (2004) found that Australian mining companies disclosed relatively few of the reporting elements that could accurately indicate environmental performance. More specifically, only 'Energy', 'Emissions, effluents and waste' and 'Compliance' were consistently reported elements. Other studies into

environmental reporting in the mining industry have also identified incompleteness, incomparability and inconsistency as the main problems with this type of reporting (Filipovic, 2006; Christopher, Hutomo & Monroe, 1997). Although environmental reporting might provide useful information to decision makers, it is currently unclear, as evidenced by the wide number of theories in different studies, as to why certain firms choose to report this information, while others do not.

Given this trend and the differences between companies in voluntary environmental reporting, it is of interest to examine the changes in the level and type of environmental issues reported, based on a specific time period, and the political characteristics of Australian listed mineral mining companies that choose to report environmental information in their annual reports.

Research Objectives

There are two main objectives in this study. They are as follows:

1. Evaluate the changes in environmental reporting over 2007-2010, in terms of type and volume of information disclosed in the Australian mineral mining industry, using the 2006 GRI Guidelines (G3 Guidelines).
2. Identify the key political characteristics of companies that volunteer to disclose environmental information in their annual reports.

Research Motivation and Significance

In this study, the Australian mineral mining industry was chosen for an examination of environmental reporting. The reason for focusing on the Australian mining industry is that it is “a major employer, a big investor, a major export earner, and an important supplier of energy and raw materials to other industries” (Panchapakesan & McKinnon, 1992, p. 76). Moreover, Australia has greatly gained benefits from the current mining boom, reflected in “high rates of economic growth, record low levels of unemployment and increasing incomes for Australians” (“Mining”, 2011). However, mining has had a substantial deleterious environmental impact in Australia, and the Australian mining industry has become the subject of intense scrutiny by environmental lobby groups. Potential irreversible environmental impact, which may occur due to mining activities, include “acid mine drainage, erosion and sedimentation, chemical release, fugitive dust emission, habitat destruction, surface- and ground water contamination, and

subsidence” (Kachhap, 2009, p. 2). External publics, such as investors and stakeholders, have become increasingly concerned about these types of environmental impacts. In response to the increasing criticism, Australian mining companies have started to implement environmental protectionist activities and disclose them in their annual reports.

Consequently, the chief focus and concern of the study is on environmental reporting disclosed in the annual reports of the Australian mineral mining industry. The reason for specifically choosing the minerals sector is that “the strength of the mineral mining sector is critical to Australia’s economic performance” (“Mining”, 2011). The Australian mineral mining industry involves the exploration and mining of a range of minerals, which can be classified as “base metals, gold and precious metals, mineral sands, diamonds, iron ore and other steel related ores” (“Resources sector”, n.d.).

This study has practical and theoretical significance. Initially, it used the latest GRI index, G3 version, to identify the changes in the level of environmental reporting in the Australian mineral mining industry across a specific time period, based on the year of issue of the G3 Guidelines. This is of particular significance because previous studies have not solely used G3 Guidelines to evaluate the recent changes in the extent of environmental reporting in Australia. Subsequently, it aims to explain the reasons for the differences in the level of disclosure in different companies using political cost framework. Furthermore, the results of this research could have implications for the regulators of financial information relating to the possibility of standardising environmental disclosure, and for users (i.e. lenders and investors), who use this information to guide their decision-making.

Organisation of the Study

This thesis is organised in the following format. Chapter one introduces this study by stating the research background, research objectives, expected outcomes, research motivation and significance, as well as providing an outline of this study. Chapter two reviews the related environmental regulation in Australia and outlines the Global Reporting Initiative (GRI) guidelines. Chapter three reviews the related literature of this study covering Non-GRI review and GRI review, as well as a political cost framework review. The Non-GRI and GRI reviews include studies on the extent and type of environmental reporting, as well as determinants of voluntary environmental reporting. Details of the theoretical framework and the development of hypotheses are described

in chapter four. Chapter five outlines the research methodology employed in the study. An analysis of environmental disclosure results is presented in chapter six, followed by examinations of diagnostic statistics and analysis of univariate and multiple regression results in chapter seven. The final chapter concludes with summaries of chapters, findings of the study, implications, limitations and suggestions for future research.

CHAPTER 2

GLOBAL REPORTING INITIATIVE INDEX

Introduction

The objective of this chapter is to present the environmental reporting guideline selected for this study, which is the Global Reporting Initiative (GRI) Sustainability Reporting Guidelines. This chapter is designed to review regulation on environmental disclosure, to explain why the GRI index was selected over other environmental frameworks and to examine the development of the GRI guidelines. This chapter also offers a description of environmental indicators in the G3 Guidelines, and items excluded from the index.

Regulation Review on Environmental Disclosure

In Australia, “requirements for mandatory environmental disclosure are as yet only in the introductory stage and have many inconsistencies” (Ross & Wood, 2008, p. 4). While such requirements exist, environmental disclosure within Australian annual reports remains mostly voluntary.

The first mandatory environmental accounting disclosures were introduced by the extractive industry accounting standard in 1989, AASB 1022, *Accounting for the Extractive Industries*, which required Australian companies to report on restoring and rehabilitating their abandoned mine sites within their annual reports. However, it did not require companies to disclose accounting policies on relevant obligations (Frost, 2007; Hardy & Frost, 2001). Subsequently, in 1995, the Urgent Issues Group (UIG) released UIG Abstract 4, *Disclosure of Accounting Policies for Restoration Obligations in the Extractive Industries*, which aimed to clarify AASB 1022, regarding the reporting requirements for restoration obligations. Due to its specific scope and requirement issues (Clarkson, Overell & Chapple, 2011), AASB 1022 was replaced in 2005 with AASB 6, *Exploration for and Evaluation of Mineral Resources*. Restoration obligations are covered by AASB 137, *Provisions, Contingent Liabilities and Contingent Assets*, and UIG Interpretation 1, *Changes in Existing Decommissioning, Restoration and Similar Liabilities* (Frost, 2007).

As at the sample period (2007-2010), the relevant legislation is s. 299(1)(f) *Corporations Act 2001* (Cth): “If the entity’s operations are subject to any particular and significant environmental regulation ... give details of the entity’s performance in

relation to environmental regulation.” It is the first explicit requirement for the environmental disclosure within the annual report, introduced by the Australian government in 1998. However, the scope of s. 299(1)(f) is “black letter law, referring to ‘particular and significant environmental regulation’ under statutory laws”(Clarkson, Overell & Chapple, 2011, p. 6). Given concerns of the potential ambiguity of the required disclosures, Practice Note 68 (PN 68) was issued by the Australian Securities and Investments Commission (ASIC) in 1998. It sought to provide guidance and assistance as to which companies should disclose their environmental performance, and what details were required. However, PN 68 was criticised for not providing such guidance (Thompson, 1999). Subsequently, the Parliamentary Joint Statutory Committee for Corporations and Securities (PJSC) recommended that s. 299(1)(f) be deleted (PJSC, 1999). The provision, however, remains in the latest version of the *Corporations Act 2001* and received the support of the Australian Industry Group (AIG, 1999) and the Corporations and Markets Advisory Committee (CAMAC, 2006).

Frost (2007) notes that although s. 299(1)(f) requires a simple statement of compliance with the relevant regulations as a minimum, there are still a significant number of firms that fail to disclose this. Regardless of the requirements of s. 299(1)(f), the disclosure of environmental information within Australian annual reports appears mostly voluntary, “with firms exercising discretion regarding what environmental regulations are recognised as ‘significant’” (Clarkson, Overell & Chapple, 2011, p. 7).

There are also mandatory disclosure requirements existing outside of the annual report. Firstly, the National Pollutant Inventory (NPI), which was established in 1998, is a publicly available database, providing “information on the types and amounts of certain chemical substances being emitted to air, land and water environments” (“Environmental protection and heritage council”, 2011). The NPI requires firms that exceed threshold levels of relevant emissions submit annual reports to State and Territory Governments, and subsequently, State and Territory Governments compile and submit the reported data into the NPI database. Secondly, the *Energy Efficiency Opportunities Act 2006* (Cth), which took effect on 1 July 2006, requires large energy using businesses to assess their energy use and efficiency savings and report publicly on the relevant outcomes. Thirdly, the *National Greenhouse and Energy Reporting* (NGER) *Act 2007* (Cth), which took effect on 1 July 2008, requires firms that meet any of the corporate group reporting thresholds, to report “information about greenhouse gas emissions, greenhouse gas projects and energy use and production of corporations”

("National greenhouse and energy reporting", 2011) to the Greenhouse and Energy Data Officer. Subsequently, the Greenhouse and Energy Data Officer makes the reported data available to the public by electronic or other means. However, corporation confidentiality is maintained under the provisions of the NGER Act.

To sum up, environmental disclosure in Australian remains mostly voluntary, with only minuscule changes in regulatory environment over the study period. These changes, however, do not have any impact on this research, except for the requirement of restoration obligation by AASB 6 and AASB 137.

The Use of Global Reporting Initiative (GRI) Index

After reviewing the relevant regulation, it is known that environmental reporting remains voluntary, and there are no current mandatory standards for organisations to follow in preparing their disclosure reports. In order to provide a consistent guideline for the disclosure of environmental information, frameworks for environmental reporting were created. Such popular frameworks include (Golob & Bartlett, 2007; Hopkins, 2003; Jose and Lee, 2007; Lin, 2010; Reynolds & Yuthas, 2008): CERES Report from the Coalition for Environmentally Responsible Economics (CERES); Public Environmental Reporting Initiative; ICC Business Charter for Sustainable Development by International Chamber of Commerce (ICC); ISO 14000 Series by the ISO; AA1000 AccountAbility Principles Standard 2008 by the AccountAbility (AA); Dow Jones Sustainability Indexes (DJSI) by the Dow Jones; Global Reporting Initiative Sustainability Reporting Guidelines by the Global Reporting Initiative (GRI) and many others.

Among these various guidelines, the GRI Sustainability Reporting Guidelines are the most commonly used framework and are institutionalized as the preeminent global framework for voluntary corporate environmental reporting. Moreover, the GRI index is the most comprehensive framework, which has already included elements of other frameworks such as ISO 14000, and the Global Sullivan Principles in its reporting guidelines (Hopkins, 2003). In order to improve the quality, rigour, and utility of environmental reporting, the GRI guidelines are designed to be a long-term, multi-stakeholder international enterprise that provides corporations with a framework for voluntarily disclosing the environmental information of their operations, products, services, and activities (Hussey, Kirsop & Meissen, 2001).

The Australian Government Department of the Environment and Heritage (DEH) has recommended the GRI guidelines be followed. Many studies have also indicated that the GRI guidelines are the preferred format for those organisations to disseminate environmental information (Brown, Jong & Lessidrenska, 2009; Finch, 2005; KPMG 2008).

The KPMG Survey into Corporate Social Responsibility (KPMG, 2008) investigated the top 250 firms from the Global Fortune 500 (Global 250) and the 100 largest firms by revenue (N100) in 22 countries. They found that in the 2007-2008 financial year, more than 75% of the G250 and nearly 70% of the N100 apply the GRI guidelines for their environmental and social reporting. Brown et al.'s (2009) study on the rise of the GRI indicated that the GRI guidelines were successfully created to be a visible and prestigious global undertaking and to institutionalise environmental reporting by corporations worldwide. Moreover, Finch (2005) stated that in Australia, the mining sector is the most represented sector that adopts GRI reporting. For these reasons, the GRI guidelines are used in this study to measure the level of environmental reporting.

Development of the GRI Guidelines

The GRI Sustainability Reporting Guidelines include three reporting aspects, which are economic, environmental, and social performance. The GRI organisation issued its first set of Guidelines (G1) in 2000, followed by a revised second version in 2002, known as the G2 Guidelines. However, the performance indicators for economic, environmental and social activities in the G1 and G2 Guidelines were criticised, regarding whether the indicators fairly measured and properly described a company's sustainability performance (Lin, 2010). Hence, the third version (the G3 Guidelines) was issued in October 2006. It has enhanced performance indicators through a multi-stakeholder approach, which refers to collaborating with more stakeholders from companies, non-governmental organizations, labor unions, accounting firms, investment institutions, and academia (GRI, 2006). The latest and most complete version of GRI's guidelines are the G3.1 Guidelines (published in 2011), which are "based on G3 but contain expanded guidance on local community impacts, human rights and gender" ("Reporting framework", n.d.). Since the study only focuses on the environmental reporting, the G3.1 Guidelines do not influence the use of GRI's G3 Guidelines.

The GRI organisation has also published the Mining and Metals Sector Supplement, which is a version of the G3 Guidelines tailored for the mining and metals sector. The final complete version of the Supplement, however, was released in March 2010. This study focuses on the environmental disclosure during the year 2007, 2008, 2009 and 2010. Hence, this specific Supplement is not applicable in this study. Moreover, except for three additional indicators, the Supplement contains the same environmental performance indicators with the G3 Guidelines. The Mining and Metals Sector Supplement, therefore, does not impact on the use of the G3 Guidelines in this study.

Description of the G3 Guidelines - Environmental Indicators

The G3 index consists of 79 voluntary indicators on which to be reported (GRI, 2006). They are grouped into economic, environmental and social performance indicators. Thirty environmental indicators to be reported on are grouped into nine categories: “Materials”, “Energy”, “Water”, “Biodiversity”, “Emissions, Effluents and Waters”, “Products and Services”, “Compliance”, “Transport”, and “Overall” (GRI, 2006). Table 2.1 presents the summary of environmental indicators of the G3 index.

Table 2.1
Global Reporting Initiative (GRI) Guidelines - Environmental Indicators

Indicators	Description
Materials	
EN1:	Materials used by weight or volume.
EN2:	Percentage of materials used that are recycled input materials.
Energy	
EN3:	Direct energy consumption by primary energy source.
EN4:	Indirect energy consumption by primary source.
EN5:	Energy saved due to conservation and efficiency improvements.
EN6:	Initiatives to provide energy-efficient or renewable energy-based products and services, and reductions in energy requirements as a result of these initiatives.
EN7:	Initiatives to reduce indirect energy consumption and reductions achieved.

Table 2.1 *cont'd.*

Indicators	Description
Water	
EN8:	Total water withdrawal by source.
EN9:	Water sources significantly affected by withdrawal of water.
EN10:	Percentage and total volume of water recycled and reused.
Biodiversity	
EN11:	Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas.
EN12:	Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas.
EN13:	Habitats protected or restored.
EN14:	Strategies, current actions, and future plans for managing impacts on biodiversity.
EN15:	Number of IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction risk.
EN16:	Total direct and indirect greenhouse gas emissions by weight.
EN17:	Other relevant indirect greenhouse gas emissions by weight.
EN18:	Initiatives to reduce greenhouse gas emissions and reductions achieved.
EN19:	Emissions of ozone-depleting substances by weight.
EN20:	NO _x , SO _x , and other significant air emissions by type and weight.
EN21:	Total water discharge by quality and destination.
EN22:	Total weight of waste by type and disposal method.
EN23:	Total number and volume of significant spills.
EN24:	Weight of transported, imported, exported, or treated waste deemed hazardous under the terms of the Basel Convention Annex I, II, III, and VIII, and percentage of transported waste shipped internationally.
EN25:	Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the reporting organization's discharges of water and runoff.
Products and Services	
EN26:	Initiatives to mitigate environmental impacts of products and services, and extent of impact mitigation.
EN27:	Percentage of products sold and their packaging materials that are reclaimed by category.

Table 2.1 *cont'd.*

Indicators	Description
Compliance	
EN28:	Monetary value of significant fines and total number of non-monetary sanctions for non- compliance with environmental laws and regulations.
Transport	
EN29:	Significant environmental impacts of transporting products and other goods and materials used for the organization’s operations, and transporting members of the workforce.
Overall	
EN30:	Total environmental protection expenditures and investments by type.

(GRI, 2006)
Note The disclosure of cost of site restoration, which is part of the environmental protection expenditure (EN30), is excluded from EN30, as this is not a voluntary disclosure item.

Item Excluded from the Index

For this study, all 30 indicators are considered. However, disclosure of cost of site restoration, which is part of the environmental protection expenditure disclosure (EN30), is excluded. This disclosure item is not considered voluntary because it is a mandatory requirement of AASB 6, *Exploration for and Evaluation of Mineral Resources*. AASB 6 requires companies to report on restoring and rehabilitating their abandoned mine sites, within their annual reports. The requirements for the restoration obligations are covered by AASB 137, *Provisions, Contingent Liabilities and Contingent Assets*, and UIG Interpretation 1, *Changes in Existing Decommissioning, Restoration and Similar Liabilities*. Therefore, the disclosure of the cost of site restoration is excluded as an EN30 indicator.

Summary

This chapter has presented the regulation review on environmental disclosure. It has also outlined the Global Reporting Initiative (GRI) guidelines, by articulating the reasons for selecting the GRI index for this study, examining the development of the GRI guidelines and introducing the environmental components of the index. The next chapter will focus on the review of relevant literature on environmental reporting, including the Non-GRI review, GRI review and the political cost framework review.

CHAPTER 3

LITERATURE REVIEW

Introduction

The 1990's saw the environment become an important public issue (Razeed, 2010). "Internationally negotiated documents such as the Rio Declaration and Agenda 21, both approved at the Earth Summit held in Rio de Janeiro in 1992, call for governments and companies alike to disclose information on the state of the environment and on the environmental impacts of their activities" (Perez & Sanchez, 2009, p. 949). Over the past few decades, there has been a series of studies on environmental reporting that indicate an increased trend towards greater voluntary environmental disclosures. Voluntary environmental disclosures are free choices made by the company's management to provide accounting and other information relevant to decision makers. Prior studies have also used a range of theoretical frameworks to examine factors that influence companies to voluntarily disclose environmental information.

In response to increasing criticism, many companies began to pay serious attention to their environmental impact. Specifically, mining industry is at forefront of environmental reporting (Perez & Sanchez, 2009). In recent years, there has been also an increasingly focused debate on mining and its environmental responsibility, due to strong public sentiment on environmental issues surrounding the worldwide mining industry. In response to this pressure, mining companies implemented environmental protection activities (such as treatment of emissions, disposal of waste and environmental management), which they disclose in their annual reports (Christopher, Hutomo & Monroe, 1997).

The questions that motivate this review are: What is the extent of environmental reporting in general? What studies have been done on environmental reporting using the GRI guidelines? What is the level of environmental disclosures in the mining industry?

The review is divided into two main parts: Non-GRI review and GRI review. In each part, the review is placed on the extent of environmental reporting, in diverse industries, and specifically, in the mining industry. In addition, a review of political cost framework is covered in this chapter.

Non-GRI Review

There has been a plethora of studies into environmental reporting but this section specifically reviews those studies in which the GRI index was not selected to guide the research. A summary of literature regarding Non-GRI review is presented in Table 3.1.

The Extent and Type of Environmental Reporting

Burritt, Schaltegger, Kokubu, and Wagner (2002) identified the importance of environmental information and showed that more than 50% of companies in Australia, Germany and Japan rate the environment as a corporate priority. Many other studies have also noted that globally, both corporations and the community have recognised the necessity for environmental reporting (Deegan & Gordon, 1996; Gibson & O'Donovan, 2007; Kolk, 2005; KPMG 2008).

The first study that focused specifically on environmental disclosures in Australia was by Deegan and Gordon (1996), who assessed 197 annual reports for the 1991 financial year, and examined a sample of 25 firm's annual reports for the years 1980, 1985, 1988 and 1991 within the 197 sample firms, and also sent a questionnaire relating to environmental issues to 41 environmental lobby groups. While the annual reports reflected the emerging public concern over environmental topics, the level of voluntary environmental disclosures in Australia was usually low. The report was mostly positive, with little or no negative information being released by the firms in the study. It was noted that the extent of voluntary disclosure was likely to depend on the environmental lobby groups' concern about the ecological sustainability and awareness of companies. The mining industry ranked number one in their concern levels regarding environmental effects.

By 2003, Gibson and O'Donovan (2007) found that more companies were disclosing an increasing volume of environmental information across diverse categories in annual reports in Australia. They assessed 41 Australian companies' annual reports covering the period 1983–2003 and measured the volume of environmental disclosure for “financial, quantifiable non-financial and descriptive information” (Gibson & O'Donovan, 2007, p. 948).

Gibson and O'Donovan found that the percentage of companies providing environmental disclosure increased from 46% (1983) to 100% (2003), with a minimum of 27% in 1986. They also found that the relative volume of this information was

increasing across all categories of environmental disclosures. The number of firms who disclosed “Financial Environmental Information” increased by 63% from 1983 to 1998 and then plateaued around 60% until 2003. Firms reporting “Quantifiable Non-Financial Information” increased by 38% from 1983 to 1996. The percentage of disclosing companies was similar for 1997 to 2003 although strong annual fluctuations were evident. Companies reporting “Descriptive Environmental Information” increased from 29% in 1984 to 100% in 2003.

Environmental reporting has also been studied on a global basis. Kolk’s (2005) study of voluntary disclosure in the 250 Triad companies from Fortune Global 500 (top 250) revealed a significant increase in environmental reporting among multinational companies in Japan and Europe from 1999 to 2002, while the US remained constant. Approximately 60% of the companies in Japan and Europe in this study disclosed environmental reporting. Kolk also noted that differentiation in the level of environmental disclosure existed between countries.

The findings in the KPMG Survey into Corporate Social Responsibility (KPMG, 2008) were that for the 2007-2008 financial year, almost 80% of the largest 250 companies from the Global Fortune 500 provided environmental reports, while for the largest 100 firms by revenue in 22 countries, the rate was much lower (45%). The findings also indicated that the environmental reporting across countries differed, with Japan and the UK rating highest.

The Extent and Type of Environmental Reporting in the Mining Industry

Based on the 1989 annual reports for 226 multinational corporations from the U.S., U.K. and Continental Europe, Roberts, Meek and Gray (1995) found that the oil, chemicals, and mining group disclosed more environmental information than the other three industry groups: engineering; metals, building materials, and construction; and consumer goods and services.

In Australia, Hutomo (1995) reviewed annual reports, for the financial year 1993, from 104 Australian listed mineral mining companies to examine the extent of voluntary environmental disclosure. He found that in 1993, 63% of sampled Australian listed mineral mining companies provided voluntary environmental disclosures. Within those disclosures, the highest information to be voluntarily disclosed in the annual report was information relating to corporate environmental policies and strategies and the

lowest information to be disclosed was information about environmental liabilities. The categories of disclosure were developed based on a literature review and an analysis of a random sample of ten corporate annual reports.

Similar research was conducted by Christopher, Cullen and Soutar (1998). Their study of Australian mining companies' environmental disclosure analysed both quality and quantity of environmental disclosure. They found that in 1993, only 63% of companies made voluntary environmental disclosures of a qualitative or quantitative nature. Environmental disclosures by mining companies were of low quality. Quantitative disclosures were generally poor, with only 7% making voluntary environmental disclosures about current or expected costs and 13% making disclosures about the implementation of environmental audits or the monitoring of environmental performance. In this study, annual reports for the financial year 1993 of 104 mineral mining companies listed on the Australian stock exchange were reviewed. Fifteen environmental disclosure items were developed based on a combination of a review of prior literature, consultation with relevant experts, and an analysis of a random sample of ten annual reports.

Environmental reporting in the mining industry has also been studied on a global basis. KPMG's survey on global reporting trends (KPMG, 2003) found that 92% of all firms reported on environmental and social issues in their annual report and 44% published a stand-alone sustainability report. In the survey, KPMG reviewed the annual reports for the year 2003, produced by 50 mining companies worldwide.

KPMG's Global Mining Reporting Survey in 2006 (KPMG, 2006) found results that supported those figures. They revealed that more than 80% of companies provided information on environmental issues. It was also noted that 59% published a separate sustainability report, in which environmental issues appeared as one of the key elements.

The review of this section indicates an increase in the extent of environmental disclosures, especially in the mining industry. However, when identifying the environmental disclosures, some prior studies have only classified the disclosures broadly as 'environment' related, rather than identifying and articulating the particular items that have been disclosed; others have identified the particular items but not used the GRI guidelines.

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Table 3.1: Summary of Main Studies Reviewed

Non - GRI Review (summary of the studies where the GRI index was not selected to guide the research)

Author(s) & Year	Journal	Objective of Study	Sample & Statistics	Findings Relevant to the Study
Christopher, Cullen and Soutar (1998)	Accountability & Performance	The study examined the relationship of Australian listed mineral mining companies' characteristics to the quality of voluntary environmental disclosures within the stakeholder theory framework.	<p>Annual reports for the financial year 1993 of 104 mineral mining companies listed on the Australian stock exchange were reviewed.</p> <p>Correspondence analysis, multiple regression, and multicollinearity test were undertaken.</p>	<p>In 1993, only 63% of companies made voluntary environmental disclosures of a qualitative or quantitative nature.</p> <p>Environmental disclosures by mining companies were of low quality.</p> <p>Meanwhile, quantitative disclosures were also poor, with only 7% made voluntary environmental disclosures about current or expected costs and 13% made disclosures about the implementation of environmental audits or the monitoring of environmental performance.</p>

Table 3.1 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Sample & Statistics	Findings Relevant to the Study
Deegan and Gordon (1996)	Accounting and Business Research	The study investigated the environmental disclosure practices of Australian companies.	<p>A sample of 197 firms' annual reports for the 1991 financial year.</p> <p>A random sample of 25 firms from the entire 197 firms sample was selected and their annual reports for the years 1980, 1985, 1988 and 1991 were examined.</p> <p>Forty-one environmental lobby groups were asked to answer a questionnaire relating to environmental issues.</p> <p>Descriptive statistics and Pearson correlation were employed.</p>	<p>The annual reports reflected the emerging public concern over environmental topics.</p> <p>The level of voluntary environmental disclosures in Australia was usually low, and they were mostly positive, with little or no negative information being made by all firms in the study.</p> <p>It was noted that the extent of voluntary disclosure was likely to depend on the environmental lobby groups' concern about the ecological sustainability and awareness of companies. The mining industry ranked number-1 in concern levels regarding environmental effects.</p>

Table 3.1 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Sample & Statistics	Findings Relevant to the Study
Gibson and O'Donovan (2007)	Corporate Governance	It examined the level and type of environmental information disclosed in companies' annual reports.	<p>The study looked at the corporate annual reports of 41 publicly listed Australian companies across eight industry groups covering the period 1983–2003.</p> <p>The industry included Chemicals (4 companies), Paper and Packaging (3 companies), Engineering (4), Transport (3), Mining (6), Oil and Gas (4), Solid Fuels (3), and diversified industries that did not conform to the other groupings (14).</p> <p>The level of environmental disclosure by type, grouped into financial, quantifiable non-financial and descriptive information was tested.</p> <p>Content analysis (number of pages) was employed.</p>	<p>The percentage of companies providing environmental disclosure increased from 46% (1983) to 100% (2003), with a minimum of 27% in 1986.</p> <p>They also found that the relative volume of this information was increasing across all categories.</p> <p>The number of firms who disclosed "Financial Environmental Information" increased by 63% from 1983 to 1998 and then plateau around 60% until 2003. Firms reporting "Quantifiable Non-Financial Information" increased by 38% from 1983 to 1996.</p> <p>The percentage of disclosing companies was similar for 1997 to 2003 although strong annual fluctuations were evident. Companies reporting "Descriptive Environmental Information" increased from 29% in 1984 to 100% in 2003.</p>

Table 3.1 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Sample & Statistics	Findings Relevant to the Study
Global Mining Reporting Survey (KPMG, 2006)	Not applicable	It investigated global reporting trends in the mining industry in 2006.	<p>They surveyed the annual reports for the year 2006 produced by 44 mining companies from South Africa, Canada, United Kingdom, Australia, United States, BRICs.</p> <p>No statistics were applied.</p>	<p>59% published a separate sustainability report, where environmental issues figured as one of the key elements included in the reports.</p> <p>More than 80% of companies provided information discussing environmental issues.</p> <p>It was also noted that the level of detail included in sustainability reports varied. 60% of companies presenting environmental and social information did so in a detailed manner.</p>
Hutomo (1995)	Unpublished honours thesis	The study examined the extent of voluntary environmental disclosure in relation to firm-specific characteristics of listed mineral mining firms within the stakeholder theory framework.	<p>A sample of 104 Australian listed mineral mining companies was selected. Annual reports of financial year 1993 were used to examine the extent of environmental disclosure. Annual reports of financial year 1992 were also used for additional information.</p> <p>Descriptive statistics, ordinary least squares, and multicollinearity test were undertaken.</p> <p>Three indices, word index, unweighted index and weighted index, were applied.</p>	<p>In 1993, 63% of sampled Australian listed mineral mining companies provided voluntary environmental disclosures.</p> <p>Within those disclosures, the highest information to be voluntarily disclosed in the annual report was information relating to corporate environmental policies and strategies and the lowest information to be disclosed was information about environmental liabilities.</p>

Table 3.1 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Sample & Statistics	Findings Relevant to the Study
Kolk (2005)	Management International Review	<p>The paper investigated the differences in patterns and trends in reporting by Triad multinationals, and examined the occurrence of convergence and the influence of institutional factors.</p>	<p>All the Triad companies in the Fortune Global 250 (the first half of Fortune's Global 500 list) as published on 3 August 1998 and survived into 2002, were selected.</p> <p>The sample included 72 companies from USA, 52 from Japan and 79 from Europe.</p> <p>Both 1998/1999 and 2001/2002 financial years' data was collected. All companies in sample were requested to send their most recent annual reports, or environmental, social or sustainability report.</p> <p>Descriptive statistics were employed.</p>	<p>There was a significant increase in Japan and Europe in environmental reporting amongst multinational companies, while US remained constant.</p> <p>Approximately 60% of the companies both in Japan and Europe in this study disclosed environmental reporting.</p> <p>It was also noted that differentiation in the level of environmental disclosure existed between countries.</p>

Table 3.1 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Sample & Statistics	Findings Relevant to the Study
KPMG Survey into Corporate Social Responsibility (2008)	Not applicable	Investigated corporate social responsibility for the year 2008 on a global basis.	<p>The survey consisted of the top 250 from the Global Fortune 500 (Global 250) and the 100 largest companies by revenue (N100) in 22 countries, which are Australia, Brazil, Canada, Czech Republic, Denmark, Finland, France, Hungary, Italy, Japan, Mexico, Norway, Portugal, Romania, South Africa, South Korea, Spain, Sweden, Switzerland, The Netherlands, United Kingdom, United States.</p> <p>The information was collected for the 2007-2008 financial year.</p> <p>Companies that provided sustainability reports and sections within their company websites, corporate responsibility reports, and annual reports were considered.</p> <p>No statistics were applied.</p>	<p>Almost 80% of the largest 250 companies from the Global Fortune 500 provided environmental reports, while for the largest 100 firms by revenue in 22 countries, the rate was much lower (45%).</p> <p>The environmental reporting across countries also differed, with Japan and the UK leading the way.</p> <p>More than 75% of the G250 and nearly 70% of the N100 apply the GRI Guidelines for their environmental reporting.</p> <p>It was also noted that differentiation existed on environmental reporting among industries.</p>

Table 3.1 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Sample & Statistics	Findings Relevant to the Study
Mining: The Survey of Global Reporting Trends (KPMG, 2003).	Not applicable	It investigated global reporting trends in the mining industry in 2003.	KPMG surveyed the annual reports for the year 2003 produced by 50 mining companies from South Africa, Canada, United Kingdom, Australia, United States, BRICs (Brazil, Russia, India, and China). No statistics were applied.	92% of all companies report on environmental issues in their annual report and 44% of which published a standalone sustainability report.
Roberts, Meek and Gray (1995)	Journal of International Business Studies	The study examined factors influencing the voluntary strategic, financial and nonfinancial disclosures in U.S., U.K. and Continental Europe.	Two hundred twenty-six multinational corporations from the U.S., U.K. and Continental Europe (specially, France, Germany and the Netherlands) were selected. Annual reports for financial year 1989 were reviewed. Voluntary disclosures of three types of information (strategic, nonfinancial, financial) were examined. Content analysis (unweighted scores) and descriptive statistics were employed.	The oil, chemicals, and mining group disclosed more environmental information than other three industry groups (engineering; metals, building materials, and construction; and consumer goods and services). Mining industry might also be more politically sensitive than the others. 14% of the sample companies disclosed financial information in their annual reports; 46% reported nonfinancial information; and 33% disclosed strategic information.

GRI Review

This section reviews the studies on the extent of environmental reporting and the factors influencing the level of environmental disclosures, where the GRI index was used as a guideline for providing disclosure items, or indicators in order to examine the extent of environmental disclosures in the studies. A summary of literature regarding GRI review is presented in Table 3.2.

The Extent and Determinants of Environmental Disclosure

In Australia, there was an increase of 49% in environmental disclosure between 1998 and 1999 (Raar, 2002). Raar reviewed 1998 and 1999 annual reports of 425 Australian Stock Exchange listed companies, and the GRI index (the first version) was used to identify environmental disclosure categories.

In 2004, Filipovic (2006) showed that the level of environmental disclosures in Australia was extremely low, with only 10% of 450 Australian companies' 2004 annual reports containing disclosures. Filipovic used the GRI guidelines (G2 Guidelines) as indicators and employed positive accounting theory to explain voluntary environmental reporting. She found that the level of environmental disclosure had a significant positive relationship with ownership, leverage, size of the firm and industry type, while variables of big four audit firms and profitability were not significantly related, but still supported a positive trend.

The most recent study on environmental reporting in Australia is from Clarkson, Overell and Chapple (2011), who assessed the associations between corporate environmental performance and both the level and the nature of voluntary environmental disclosures. They reviewed reports (annual, stand-alone environmental or sustainability reports) of 51 firms that reported to the National Pollutant Inventory in 2002 and 2006. They found that while there was a moderate improvement in disclosure between 2002 and 2006, with the highest score obtained being only around 50% of the maximum possible value. The results also indicated that firms, which were more likely to release pollutants, disclosed more environmental information. In this study, environmental disclosure was scored using a content analysis index developed by Clarkson, Li, Richardson and Vasvari (2008) based on the GRI guidelines (G2 Guidelines).

Similar studies were also conducted in other countries. In evaluating 34 specific environmental indicators arising from several environmental reporting guidelines, such as the ICC Business Charter and GRI, for 200 multinational companies' website reports of year 2002, Jose and Lee (2007) found that 70% of the 200 largest companies in the world disclosed environmental information.

In the UK, Brammer and Pavelin (2008) found that 57% of 450 large UK companies made voluntary environmental disclosures in 2000. They used relevant indicators, phrases, or terms from the 2002 GRI Guidelines (G2 Guidelines), the "Association of Chartered Certified Accountants (ACCA), Business in the Environment (BIE), [and] the International Organisation for Standardisation (ISO)" (Brammer & Pavelin, 2008, p. 1176), as well as prior literature. For the determinants of environmental disclosure, Brammer and Pavelin used stakeholder theory to develop hypotheses and found that firms which were large, were less indebted, and had a more dispersed ownership structure were significantly more likely to provide voluntary environmental disclosures; highly leveraged companies were significantly less likely to make these disclosures. They also reported a positive association between disclosures and both firm size and corporate environmental impact.

Ho and Taylor (2007) investigated environmental disclosures of 50 firms with the highest market capitalisation in early 2003 for both Japan and US; firms in these countries reported more than 30% of the selected environmental disclosure items. It was also noted that Japanese companies reported significantly more environmental information than US firms. In this study, 20 environmental criteria were selected from the 2002 GRI Guidelines (G2 Guidelines), plus any legally required accounting disclosures and some reporting indicators used in prior literature. To examine the determinants of environmental disclosure, Ho and Taylor applied agency, political and litigation costs theories, as well as signaling and information asymmetry framework. The results indicated that environmental disclosure was positively associated with firm size and negatively related to profit.

In Germany, Gamerschlag, Möller and Verbeeten (2010) reviewed annual reports and voluntary corporate social responsibility reports, as well as environmental, social, and human capital reports from a sample of 130 listed German companies. They found that the total amount of environmental disclosures increased from 2006 to 2009. It was also noted that companies from industries that were perceived as greater polluters, including

vehicle, transport and logistics, chemical, construction and basic resource sectors, provided more information on environmental issues. In this study, eight environmental related keywords and 24 social related keywords were derived from the GRI framework. The study did not mention which version of GRI guidelines it used, but according to its study period (2006-2009), it was assumed that the 2006 GRI Guidelines (G3 Guidelines) were applied. For the determinants of environmental disclosure, they employed political cost theory to investigate the variables associated with voluntary environmental disclosure. They concluded that environmental disclosure was positively related to firm size, company visibility, and profitability, as well as to the degree of dispersed shareholder ownership structure and US cross-listing.

In addition to the determinants reviewed above, industry type is also an important factor. It is directly related to environmental reporting (Ho & Taylor, 2007; Jose & Lee, 2007) because there is cross sector variation in environmental impact and pressure from stakeholders to provide environmental performance (Brammer & Pavelin, 2008).

Ho and Taylor (2007) found that industry membership was important in explaining differences in the level of environmental disclosure. Jose and Lee's (2007) study of environmental disclosure in the largest 200 multinational companies demonstrated that "companies in environmentally sensitive industries, such as automotive (100%), Oil & Gas (83.33%), and utilities (86.67%), are more inclined to disclose environmental performance information than companies in less sensitive industries, such as finance, securities, and insurance (40.74%) and other services (50%)" (p. 319). They used management theory and stakeholder theory to explain environmental reporting. Similar results were found in Brammer and Pavelin's (2008) study which revealed that companies in the chemical, utilities and retail sectors (environmentally sensitive industries) were significantly more likely to provide environmental disclosures than other firms, while finance and the high-technology firms (less sensitive industries) were significantly less likely to do so. These results indicate that the mining industry, which is environmentally sensitive, may be more likely to voluntarily disclose environmental information.

The Extent and Type of Environmental Disclosure in the Mining Industry

Yongvanich and Guthrie (2004) found that Australian mining companies disclosed relatively few of the reporting elements that could indicate environmental performance. More specifically, only “Energy,” “Emissions, effluents and waste” and “Compliance” were consistently reported elements. However, the mining industry disclosed relatively more environmental performance information than other industries, and was proactive in their sustainable development reporting. They reviewed the 2002 annual reports of the major 100 Australian mining companies and stakeholder theory was employed. Seventy-three elements in three categories including “external capital, internal capital and human capital” (p. 4), were determined to assess the extent of environmental disclosure. Ten of these elements were environmental performance indicators. The elements were selected from intellectual capital frameworks (IC), the Balanced Score Card (BSC) and the 2002 GRI Sustainability Reporting Guidelines (G2 Guidelines).

The most recent study on environmental reporting in the mining industry is from Perez and Sanchez (2009), who assessed the changes in sustainability reporting in the mining industry using “31 (sustainability) reports published between 2001 and 2006 by four major (multi-national) mining companies” (p. 13).

“A set of 62 assessment items organized in six categories (namely context and commitment, management, environmental, social and economic performance, and accessibility and assurance) were selected to guide the review” (p. 13). These 62 items were developed from the literature and accepted best practices such as the 2006 Global Reporting Initiative Guidelines (G3 Guidelines). The results revealed that there was considerable variation among companies in the types of environmental information provided. Among the “triple bottom line” dimensions, social and environmental performances were ranked one and two, respectively. The category “Environmental Performance” featured constant evolution from 67% in 2000 to 93% in 2005. It was also noted that, within each company, environmental reporting development was influenced by stakeholders, resources and nonfinancial performance disclosure experts.

In another study on the extent and type of environmental disclosure, there was evidence of total reliance on GRI guidelines. Specifically, Guenther, Hoppe and Poser (2006) checked the use of GRI (G2 Guidelines) recommended indicators on GRI-style reports of 29 mining companies in 2005. The findings were that

Only three indicators ('total water use', 'non-compliance' and 'direct energy use') are 'completely reported'. Five indicators ('air emissions', 'spills', 'indirect energy use for products', 'greenhouse gas emissions' and 'total amount of land' are completely or partially reported in more than half of the reports (p. 14).

However, the authors suggested that these eight indicators might be seen as the most important because they encompass the major environmental aspects of "direct water use, direct and indirect energy use, greenhouse gas, air emissions, spills and amount of land" (p. 12).

In this section, the extent and determinants of environmental disclosures have been reviewed. In these studies, the particular items that are being disclosed in the mining industry have been identified using specific frameworks. However, most studies developed disclosure items, based on both GRI guidelines and other frameworks, to evaluate environmental disclosure levels rather than examine the disclosure items solely from GRI guidelines.

Table 3.2: Summary of Main Studies Review

GRI Review (summary of the studies where the GRI index was partially or fully selected to guide the research)

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Brammer and Pavelin (2008)	Business Strategy and the Environment	It examined quality of voluntary environmental disclosures provided by UK companies.	Stakeholder theory	<p>A sample of around 450 large UK companies extracted from a diverse range of industries was considered.</p> <p>Data was collected in 2000.</p> <p>Descriptive statistics, correlation matrix and the Logit regression were employed.</p>	<p>A set of relevant indicators regarding the underlying phenomenon was decided based on the 2002 GRI Guidelines (G2 Guidelines), the Association of Chartered Certified Accountants (ACCA), Business in the Environment (BIE), the International Organisation for Standardisation (ISO), and prior literature.</p>	<p>Fifty-seven percent of 450 large UK companies made voluntary environmental disclosures in 2000.</p> <p>Firms which were large, were less indebted, and had a more dispersed ownership structure were significantly more likely to provide voluntary environmental disclosures; highly leveraged companies were significantly less likely to make these disclosures.</p> <p>They also reported a positive association between disclosures and both firm size and corporate environmental impact.</p> <p>There was cross sector variation in environmental impact and pressure from stakeholders to provide environmental performance.</p>

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Brammer and Pavelin (2008) <i>cont'd.</i>						Companies in the chemical, utilities and retail sectors (environmentally sensitive industries) were significantly more likely to provide environmental disclosures than other firms, while finance and the high-technology firms (less sensitive industries) were significantly less likely to do so.
Clarkson, Overell and Chapple (2011)	Abacus	The study examined how both the level and the nature of voluntary environmental disclosure by Australian companies associate with their environmental performance.	Voluntary disclosure and socio-political theories	Both annual reports and stand-alone environmental or sustainability reports of 51 firms that reported to the National Pollutant Inventory in both 2002 and 2006 were reviewed.	A content analysis index developed by Clarkson, Li, Richardson and Vasvari (2008) based on the GRI guidelines (G2 Guidelines).	While there was moderate improvement in disclosure between 2002 and 2006, the highest score obtained was only around 50% of the maximum possible value. The results also indicated that firms that were more likely to release pollutants disclosed more environmental information.

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Clarkson, Overell and Chapple (2011) <i>cont'd.</i>				Descriptive statistics, the Janis-Fadner coefficient of imbalance, and content analysis were employed.		
Filipovic (2006)	Unpublished honours thesis	The study examined the level and type of sustainability reporting in companies using the GRI index and investigated the key characteristics of Australian listed companies that voluntarily	Positive accounting theory	A sample of 450 Australian listed companies was selected. Annual reports for the financial year 2004 were reviewed.	GRI indicators (G2 Guidelines) were used in the study.	The extent of environmental disclosures in Australia was extremely low with only 10%. Environmental disclosure had a significant positive relation with ownership, leverage, size of the firm and industry type, while variables of big four audit firms and profitability were not found to be significantly related but supported a positive relationship.

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Filipovic (2006) cont'd.		disclosed sustainability information within their annual reports.		The unweighted dichotomous index, descriptive statistics, Pearson correlation and ordinary least square regression were employed.		

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Gamerschlag, Möller and Verbeeten (2010)	Review of Managerial Science	The study investigated the determinants of voluntary corporate social responsibility (CSR) disclosure based on political cost theory	Political cost theory	<p>A sample of 130 listed German companies. Annual reports and voluntary corporate social responsibility reports, as well as environmental, social, and human capital reports were examined. Four reporting periods between 2005 and 2008 were considered.</p> <p>Content analysis, descriptive statistics,</p>	<p>Eight environmental related keywords and 24 social related keywords were derived from the framework of the Global Reporting Initiative.</p> <p>The study did not mention which version of GRI guidelines it used, but according to its study period (2006-2009), it was assumed that the 2006 GRI Guidelines (G3 Guidelines) were applied.</p>	<p>The total amount of environmental disclosures increased from 2006 to 2009.</p> <p>Companies from industries that were perceived as greater polluters, including vehicle, transport and logistics, chemical, construction and basic resource sectors, provided more information on environmental issues</p> <p>It was also noted that environmental disclosure was positively related to firm size, company visibility and profitability, as well as to the degree of dispersed shareholder ownership structure and US cross-listing.</p>

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Gamerschlag, Möller and Verbeeten (2010) <i>cont'd.</i>				Pearson correlations, and ordinary least square regressions were employed.		
Guenther, Hoppe and Poser (2006)	Greener Management International	It examined the current status of environmental reporting relating to mining and oil and gas companies by the GRI.	Not applied	<p>A sample of GRI-style reports of 29 mining companies in 2005 was selected.</p> <p>Unweighted scores were employed but no statistics were applied.</p>	The study checked the use of GRI (G2 Guidelines) recommended indicators.	<p>Only three indicators (namely “total water use,” “non-compliance,” and “direct energy use”) were “completely reported,” while five indicators (“air emissions,” “spills,” “indirect energy use for products,” “greenhouse gas emissions,” and “total amount of land”) were completely or partially reported in more than 50% of the reviewed reports.</p> <p>These eight indicators might be seen as the most important because they encompass the major environmental aspects of “direct water use, direct and indirect energy use, greenhouse gas, air emissions, spills and amount of land”.</p>

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Ho and Taylor (2007)	Journal of International Financial Management & Accounting	It examined triple bottom-line disclosures of 50 largest US and Japanese firms.	Agency, political and litigation costs theories, as well as signaling and information asymmetry framework.	The sample consisted of the 50 firms with the highest market capitalization in early 2003 for both Japan and US. Data was collected based on the 2003 annual reports and stand-alone reports available at the end of November 2003.	Twenty environmental criteria were selected from the 2002 GRI Guidelines (G2 Guidelines), plus any legally required accounting disclosures and some reporting indicators used in prior literature.	They found that firms in these counties reported more than 30% of the selected environmental disclosure items. It was also noted that Japanese companies reported significantly more environmental information than US companies. Industry membership was important in explaining differences in the level of environmental disclosure. Environmental disclosure was positively associated with firm size and negatively related to profit.

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Ho and Taylor (2007) <i>cont'd.</i>				<p>Data on website disclosure were collected over a two-month period between December 2003 and January 2004.</p> <p>Environmental disclosures in annual report, stand-alone reports and special website reports were considered.</p> <p>Descriptive statistics and ordinary least squares regression were employed.</p>		

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Jose and Lee (2007)	Journal of Business Ethics	It examined the environmental management policies and practices of the 200 largest companies worldwide.	Management theory & stakeholder theory	<p>Sample consisted of the largest 200 multinational companies for 2002.</p> <p>Data was collected from the sample companies' websites.</p> <p>Content analysis was employed but no statistics were applied.</p>	<p>Thirty-four specific environmental indicators arising from several environmental reporting guidelines, such as the ICC Business Charter and GRI were considered.</p>	<p>Seventy percent of the 200 largest companies in the world disclosed environmental information on their websites.</p> <p>Companies in environmentally sensitive industries, such as automotive (100%), Oil & Gas (83.33%), and utilities (86.67%) were more inclined to disclose environmental performance information than companies in less sensitive industries, such as finance, securities, and insurance (40.74%) and other services (50%).</p>

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Perez and Sanchez (2009)	Environmental Management	It examined the extent to which sustainability reporting by leading companies in the mining industry was evolving over recent years and which dimensions of the reports are evolving the most.	Not applied	<p>Thirty-one sustainability reports, published between 2001 and 2006 on the internet by four major multi-national mining companies, were reviewed.</p> <p>Content analysis (unweighted scores) was employed but no statistics were applied.</p>	<p>A set of 62 assessment items organized in six categories (namely context and commitment, management, environmental, social and economic performance, and accessibility and assurance) was selected.</p> <p>These 62 items were developed from the literature and accepted best practices such as the 2006 Global Reporting Initiative Guidelines (G3 Guidelines).</p>	<p>There was considerable variation among companies in the types of environmental information provided in the reviewed reports.</p> <p>Among the “triple bottom line” dimensions, social and environmental performances were ranked one and two, respectively. The category “Environmental Performance” featured constant evolution from 67% in 2000 to 93% in 2005.</p> <p>Within each company, environmental reporting development was influenced by stakeholders, resources and nonfinancial performance disclosure experts.</p> <p>It was also noted that all companies declared to follow GRI guidelines.</p>

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Raar (2002)	Corporate Communications	It investigated the quantity and quality of voluntary environmental disclosures in the annual reports of the Australian Stock Exchange listed companies.	No specific theory was applied.	Annual reports for the years 1998 and 1999 for 425 Australian Stock Exchange listed companies were reviewed. The unweighted dichotomous index, counting of sentences, and descriptive statistics (chi-square, a one-way ANOVA t-test) were employed.	GRI (the first version) was used to identify environmental disclosure categories.	There was an increase in environmental disclosure by 74 firms between 1998 and 1999. Companies operating in the industry groups classified as "risky in terms of environmental impact" and "consumer focused," disclosed more environmental information than ones in other industries.

Table 3.2 *cont'd.*

Author(s) & Year	Journal	Objective of Study	Theory	Sample & Statistics	Guidelines Used	Findings Relevant to the Study
Yongvanich and Guthrie (2004)	Accounting Forum	It examined the importance of financial and nonfinancial reporting, and for financial performance reported not to be limited to information currently provided under, or able to be derived from, the traditional financial reporting framework.	Stakeholder theory	<p>The 2002 annual reports of the top 100 Australian mining companies were reviewed.</p> <p>Content analysis (counting of sentences) and descriptive statistics were employed.</p>	<p>Seventy-three elements in three main categories (external capital, internal capital and human capital) were selected based on IC frameworks, the balanced scorecard (BSC) and the GRI Sustainability Reporting Guidelines 2002 (G2 Guidelines). Ten of these elements were environmental performance indicators.</p>	<p>Australian mining companies disclosed relatively few of the reporting elements from the environmental performance items. The consistently reported elements were "Energy," "Emissions, effluents and waste" and "Compliance".</p> <p>The mining industry disclosed relatively more environmental performance information than other industries, and was proactive in their sustainable development reporting.</p>

Political Cost Framework Review

In the review of determinants of voluntary environmental disclosure in previous sections, both Jose and Lee (2007) and Brammer and Pavelin (2008) used stakeholder theory in explaining environmental reporting; Filipovic (2006) employed positive accounting theory; Clarkson, Overell and Chapple (2011) employed voluntary disclosure and socio-political theories; Ho and Taylor (2007) applied agency theory, signaling theory, litigation theory and political cost framework; and Gamerschlag, Möller and Verbeeten (2010) employed political cost theory. In these studies, few examined political cost theory. This section, therefore, reviews the development of political cost framework. Table 3.3 (a) & (b) present summaries of proxies developed by the relevant studies.

Political cost framework has been used and developed in many studies. Some (Deegan & Carroll, 1993; Panchapakesan & McKinnon, 1992) developed many proxy variables for political visibility including firm size. Panchapakesan and McKinnon (1992) examined the relationship among potential proxies for political visibility, namely firm size, market share, industry membership, capital intensity, number of shareholders, number of employees, social responsibility disclosure, and level of press coverage. A sample of 72 quoted companies were selected from the lists of industrial, and mining and oil companies contained in the January 1989 Personal Investment magazine, which was published by the BRW Group in association with the Australian Stock Exchange. Annual reports for the 1989 financial year were reviewed. They found that significant relationships between the construct of political visibility and the proxies of size, number of shareholders, number of employees, market share, social responsibility disclosure, and press coverage. Conversely, the proxies of industry membership and capital intensity were found to be non-significant.

Deegan and Carroll (1993) investigated whether firms that apply for the Australian Annual Report Award systematically differed from firms that chose not to apply. The political cost variables of firm size, rate of return, concentration, taxation and media visibility were identified. A sample of 63 Australian companies that applied for the 1990 Annual Reporting Award and 70 non-applying companies were compared based on their annual reports. Deegan and Carroll found that “there is an expectation that firms that are constantly in the media spotlight are more susceptible to political transfers than firms that rarely receive media attention” (Deegan & Carroll, 1993, p. 223). They

argued that apart from media visibility, the other proxies, namely firm size, rate of return, concentration and taxation, were highly associated with political costs.

Table 3.3 (a)
Political Cost Proxies

Author(s) & Year	Proxy
Panchapakesan & McKinnon (1992)	Firm size* Market share* Number of employees* Number of shareholders* Social responsibility disclosure* Level of press coverage (media visibility)* Industry membership Capital intensity
Deegan and Carroll (1993)	Firm size* Concentration (Market share)* Rate of return* Taxation (Effective tax rate)* Media visibility*

Note * there is a relationship between the proxy and the construct of political visibility.

Several studies (Belkaoui & Karpik, 1989; Gamerschlag, Möller & Verbeeten, 2010; Lemon & Cahan, 1997) have directly attempted to empirically examine the relationship between voluntary environmental disclosures and the political cost framework.

Gamerschlag, Möller and Verbeeten (2010) developed six political-costs related variables, which were company visibility, profitability, companies’ degree of dispersion in their share ownership structure, companies’ relationship with US stakeholders, firm size, and industry membership. Details of the study and results of the relationship between environmental disclosure and those variables were reviewed in the previous section.

Belkaoui and Karpik (1989) used a sample of 23 American corporations that were included in both the Ernst and Ernst social disclosure survey and the survey conducted by Business and Society Review, to rank the firms’ social performance. Annual reports

for the financial year 1973 were reviewed. Three political-costs related variables, which were firm size, capital intensity and systematic market risk, were developed in the study. Belkaoui and Karpik found that firms that disclosed environmental information appeared to be those having higher systematic risk and were larger in size. The variable of capital intensity was found to be not significant for voluntary environmental disclosures.

Lemon and Cahan (1997) also established a political cost explanation for environmental disclosures. Annual reports for 1990, 1992 and 1994 of sample firms from the New Zealand Stock Exchange were reviewed to determine the level of environmental disclosures, which was measured as number of words. Thirty-seven sample firms from different industries were identified based on their environmental sensitivity. Six political visibility proxies were tested. They were firm size, capital intensity, tax rate, market share, return on assets, and number of shareholders. Lemon and Cahan found that firms that were large or had high tax rates, high market shares, or high rates of return, were more likely to provide environmental disclosures. The proxies of capital intensity and number of shareholders, however, were found to be non-significant.

These various studies have developed several political cost variables (see Table 3.3 [a] & [b]). Those variables are firm size, market share, industry membership, capital intensity, number of shareholders, number of employees, social responsibility disclosure, media visibility, rate of return, concentration, tax rate, systematic market risk, share ownership structure, and companies’ relationship with US stakeholders.

Table 3.3 (b)
Political Cost Proxies

Author(s) & Year	Proxy
Gamerschlag, Möller and Verbeeten (2010)	Firm size* Profitability* Companies’ dispersion regarding its share ownership structure* Companies’ relationship with US stakeholders* Company visibility (Media visibility)* Industry membership

Table 3.3 (b) *cont'd.*

Author(s) & Year	Proxy
Belkaoui and Karpik (1989)	Firm size* Systematic market risk* Capital intensity
Lemon and Cahan (1997)	Firm size* Market share* Rate of return on assets* Tax rate (effective tax rate)* Number of shareholders Capital intensity

Note * there is a positive relationship between the proxy and the level of environmental disclosure.

Summary

Most studies on environmental reporting seek to identify current trends in reporting, including increased reporting and increased volume of environmental disclosures. Most of the above studies have not adequately identified the particular items that are being disclosed except to classify them broadly as 'environment' related. Even though some have identified the particular items, in most cases researchers developed disclosure items based on both GRI guidelines (G1, G2 or G3 versions) and other frameworks (e.g. ACCA, ISO and BIE) to evaluate environmental disclosure levels. The study by Gamerschlag, Möller and Verbeeten (2010) is the only research that solely focuses on the use of the G3 Guidelines in examining environmental disclosure levels. This study, however, evaluated environmental disclosures of German companies. In essence, most studies have examined the environmental indicators selected partially from the GRI index, but no study has separately evaluated the extent of environmental disclosure through G3 Guidelines in Australia. Consequently, there is a research gap.

The above research on causes of differences in reporting between countries, sectors, size and other factors, shows those environmentally sensitive industries disclose more than other industries. Hence, the Australian mineral mining industry will be considered in this study, due to its environmental sensitivity in terms of both its operations and its public image.

In addition, the above studies have also used different variables to identify the characteristics of companies which volunteer to disclose environmental information. However, those variables were mostly based on a combination of different theoretical frameworks, including political cost framework. Moreover, no study has applied political cost framework to examine the extent of environmental disclosure in the Australian mineral mining industry. This is also a research gap. Hence, in this study, political cost framework will be specifically applied to explain the reason why some Australian listed mineral mining organisations choose to voluntarily disclose environmental information.

This chapter has discussed the relevant literature on environmental reporting and identified a research gap. The following chapter will explain political cost theory, as it is the theoretical framework used in this study, and present the formulation of hypotheses.

CHAPTER 4

THEORETICAL FRAMEWORK AND HYPOTHESES

FORMULATION

Introduction

The objective of this chapter is to present the theoretical framework relevant to the study, and the development of hypotheses based on the theoretical framework and the literature review outlined in the previous chapter.

Political Cost Framework

Political cost framework is employed to explain why companies might elect voluntarily to disclose environmental information to parties outside the organisation. A number of theories have developed, in order to explain the reasons for voluntary environmental disclosures. This study, however, does not attempt to support or refute any of the theoretical perspectives because “distinguishing between the political cost hypothesis and other disclosure theories (e.g. stakeholder theory, legitimacy theory) is often difficult” (Birt, Bilson, Smith & Whaley, 2006, p. 242). The study attempts to analyse levels of environmental disclosure in annual reports using the political cost framework, and asserts that these disclosures provide evidence in support of that framework.

Political costs are defined as “wealth transfers imposed upon a firm by external interest groups such as labour unions, consumer groups, or government” (Deegan & Carroll, 1993, p. 220). In other words, political costs are those costs that may be imposed on the company from society as a result of particular political actions; the associated costs of these actions could include “increased taxes, increased wage claims or product boycotts” (Deegan, 2009, p. 271). The political cost hypothesis predicts that companies under political pressure will adopt policies that decrease their political costs (Deegan, 2009; Watts & Zimmerman, 1986).

A number of methods can be employed to minimise the possibility of adverse political events and the resulting costs (Watts & Zimmerman, 1978). One of them is to provide environmental disclosure, which allows companies to make positive moral capital among stakeholders and communities, in order to temper punitive sanctions as a result of a negative event (Blacconiere & Patten, 1994; Gamerschlag, Möller, & Verbeeten,

2010; Godfrey, 2005). The intensity of external pressures that each firm deals with is different, as the level of stakeholders' power, urgency and legitimacy in each firm is different (Gamerschlag, Möller, & Verbeeten, 2010). Hence, firms face different political costs and benefits. Gamerschlag, Möller and Verbeeten hypothesized that a firm will engage in corporate social responsibility if it predicts that the benefits from the engagement will be greater than the costs. Therefore, the reason why companies provide environmental disclosure can be explained as a response to outside pressure and a safeguard of their economic interest.

The political cost framework is suitable for this study because the mining industry is potentially more politically sensitive in general than industrial companies (Roberts, Meek & Gray, 1995; Panchapakesan & McKinnon, 1992), and companies with high political visibility in the marketplace would provide more disclosures regarding corporate social responsibility as a means of reducing potential political costs (Watts & Zimmerman, 1978). In other words, particular voluntary environmental disclosures can be explained as an effort to mitigate disclosing entities' potential political costs (Ness & Mirza, 1991).

Hypotheses Formulation

The following sections describe the formulation of directional hypotheses to be tested in this study. Based on political cost framework and the (theoretical) literature review in chapter two, five hypotheses are formulated here to test the relationship between voluntary environmental disclosure and selected organizational characteristics, which are company size, rate of return, effective tax rate, market share, and number of shareholders.

Company Size (SIZE)

Since larger companies are perceived as having market power and high wealth, they are more likely to attract resentment and to be political visible (Watts & Zimmerman, 1986). As a result, larger companies are more visible to political pressures (Deegan, 2009; Panchapakesan & McKinnon, 1992). These pressures include demands for greater regulation, larger expropriation, threat of nationalization, or breakup of an industry or corporation (Watts & Zimmerman, 1978). Consequently, larger companies face potentially higher political costs. To counter government intervention, larger companies will adopt policies that decrease their political costs (Watts & Zimmerman, 1986). In an

attempt to avoid these political costs, the management is likely to disclose additional voluntary environmental information.

Studies by Brammer and Pavelin (2008), Filipovic (2006), and Ho and Taylor (2007), found a positive association between size and voluntary environmental disclosure. However, not all empirical studies have supported a positive size-disclosure relationship. Davey (1982) and Roberts (1992) found there was no relationship between company size and voluntary environmental disclosure.

In previous studies, company size has been measured as market capitalisation, net sales (Filipovic, 2006), total assets (Brammer & Pavelin, 2008), or market value of equity (Ho & Taylor, 2007). When political visibility or cost is concerned, accounting researchers have often measured company size as the total assets and/or total revenue (Panchapakesan & McKinnon, 1992). In this study, total assets are used to measure the company size. The following hypothesis is tested to determine if the company size influences the level of voluntary environmental disclosure.

H1: *Ceteris paribus*, the extent of voluntary environmental disclosure in the annual reports of Australian listed mineral mining firms is positively associated with company size.

Rate of Return on Assets (RR)

Politicians, regulators and the public have used the rate of return on assets that can lead to excess profits as evidence of monopoly power (Cahan, 1992). As suggested by Lemon and Cahan (1997), rate of return is tied to large profits and monopoly power abuses; hence firms with those significant attributes appeared to be indicative of the existence of high political costs. It is also noted that the more profitable the company, the more they become visible to political pressure (Deegan, 2009; Godfrey & Jones, 1999; Watts & Zimmerman, 1978). The political cost hypothesis predicts that companies under political pressure will adopt policies that decrease their political costs (Watts & Zimmerman, 1986). To avoid these political costs, the management is likely to provide additional voluntary environmental information.

Lemon and Cahan (1997) reported that rate of return on assets had a positive association with voluntary environmental disclosure. Dhaliwal, Li, Tsang and Yang (2011) and McGuire, Sundren and Schneeweis (1988) also found that increased voluntary corporate

social disclosure was statistically related to rate of return on assets. In contrast, Jaggi and Freedman (1992) found that rate of return on assets had a negative association with corporate environmental performance. Nevertheless, the following hypothesis is tested to determine if the firm's rate of return on assets is associated with the level of voluntary environmental disclosure.

H2: *Ceteris paribus*, the extent of voluntary environmental disclosure in the annual reports of Australian listed mineral mining firms is positively associated with rate of return on assets.

Effective Tax Rate (ETR)

Effective tax rate is the ratio of income tax expense, divided by net income before tax. The most direct means of wealth transfers from the firm to the government is the taxation system (Degan & Carroll, 1993). Hence, income taxes can be perceived to be one of the components of political costs (Deegan, 2009; Watts & Zimmerman, 1986). Zimmerman (1983) and Salamon and Dhaliwal (1980) also identified the effective tax rates as an alternative measure of political visibility. Wong (1988) suggest that firms with heavy tax burdens are likely to have incentives to select accounting procedures to minimise the tax burdens. This indicates that firms with high levels of taxation liability may be subject to high levels of political costs (Ahmad, Hassan & Mohammad, 2003). To reduce the political costs associated with increased income tax, the management is likely to disclose additional voluntary environmental information.

Deegan and Hallam (1991), and Lemon and Cahan (1997) found that firms with higher effective tax rates are more likely to disclose voluntary information. Hence, the following hypothesis is tested to determine if there is a link between company's effective tax rates and voluntary environmental disclosure.

H3: *Ceteris paribus*, the extent of voluntary environmental disclosure in the annual reports of Australian listed mineral mining firms is positively associated with effective tax rates.

Market Share (MKS)

Another measure of political visibility is the market share (Panchapakesan & McKinnon, 1992). Market share is the proportion of firm sales to total sales of the industry to which the firm belongs. Firms that have captured a large market share are more likely to be viewed by society and the government as possessing monopolistic power and as earning abnormal profits (Watts & Zimmerman, 1978). Consequently, these firms are particularly vulnerable and attract higher political costs (Deegan & Hallam, 1991; Hagerman & Zmijewski, 1979; Lemon & Cahan, 1997; Wong, 1988). The political costs may be caused by lobby groups who bring pressure on the government to enact regulation of anti-trust or anti-monopoly on firms with high market share (Hagerman & Zmijewski, 1979; Panchapakesan & McKinnon, 1992). To avoid these costs, the management is more likely to voluntarily disclose additional environmental information.

In the study of environmental disclosure in New Zealand, Lemon and Cahan (1997) found a positive association between market share and level of voluntary environmental disclosure. Consequently, the following hypothesis is tested to determine if the market share is associated with voluntary environmental disclosure.

H4: *Ceteris paribus*, the extent of voluntary environmental disclosure in the annual reports of Australian listed mineral mining firms is positively associated with market share.

Number of Shareholders (SHHLD)

In firms with a large number of shareholders, small shareholders may invest capital for reasons for social and environmental responsibility concerns, and rely on annual reports more extensively than large institutional shareholders (Lemon & Cahan, 1997). Hence, firms with a large number of shareholders would “increase incentive to disclose environmental information by way of the annual report” (Lemon & Cahan, 1997, p. 87). Furthermore, Singhvi and Desai (1971) state that “corporations with a large number of stockholders tend to be more in the public eye (such as shareholders’ association, regulators and government agencies) and are, therefore, more subject to stockholders’ and analysts’ pressures for better disclosure” (p. 132). In other words, these firms are more visible to political pressure (Panchapakesan & McKinnon, 1992). The political cost hypothesis predicts that companies under political pressure will adopt policies that

decrease their political costs (Watts & Zimmerman, 1986). To avoid these political costs, the management is likely to disclose additional voluntary environmental information. Hence, the following hypothesis is tested to determine if there is a relationship between the number of shareholders and the level of voluntary environmental disclosure.

H5: *Ceteris paribus*, the extent of voluntary environmental disclosure in the annual reports of Australian listed mineral mining firms is positively associated with number of shareholders.

Summary

This chapter has presented the theoretical framework used to explain the incidence of environmental disclosure and described the political cost theory, which is the theoretical framework for this study. Five testable hypotheses were developed based on the political cost framework and the review of literature. The following chapter will discuss the methodology in terms of research design, population, sample selection, data collection and recording method, variable definitions and data analysis approaches.

CHAPTER 5

RESEARCH METHODOLOGY

Introduction

The objective of this chapter is to outline the research methodology employed to test the changes in environmental disclosure and the hypotheses developed in the previous chapter. This chapter will articulate the research design of the study, population of the study, sample selection, data collection and recording method, variable definitions, and data analysis approaches for the study.

Research Design

The first stage of this study involved analysing the contents from a sample of annual reports, during the financial years 2007 to 2010, to determine changes in the level of environmental reporting. In this analysis, the G3 Guidelines (environmental performance indicators are contained in Table 2.1 on pages 9-11) was employed to measure the level of environmental reporting in each designated year by identifying the GRI environmental performance elements reported in annual reports. The number of GRI elements reported was calculated to measure the level of environmental reporting in each year.

The second stage involved collecting information on the company size, rate of return, effective tax rate, market share, and number of shareholders for the year 2010, in order to identify the key determinants of voluntary environmental disclosure, in terms of the political cost framework. The dependant variable was the total voluntary environmental disclosure of GRI (G3 Guidelines) information (EDGRI) and the independent variables were company size (SIZE), rate of return (RR), effective tax rate (ETR), market share (MKS), and number of shareholders (SHHLD).

The justifications of choosing annual reports, as the source of information, are as follows:

1. Annual reports are considered as the chief communications path for the transmission of communication of environmental information from companies to their stakeholders (Christopher, Hutomo & Monroe, 1997; Gibson & O'Donovan, 2007; Gibson & Guthrie, 1995; ICAA, 1996; Wiseman, 1982).

2. In Australia, the corporate annual reports are the most accessible source of information, as they are publically available.
3. Since the information in corporate annual reports is audited and is within the bounds of corporate law, annual reports possess a high degree of credibility (Lodhia, 2004; Neu, Pedley & Warsame, 1998; Unerman, 2000).

Other media communication tools, such as stand-alone reports (SARs), website disclosure, advertisements and brochures, and news media, were not considered within the scope of this study. Firstly, SARs (e.g. separate environmental reports or separate sustainability reports) were excluded because annual reports are audited, whereas SARs do not have specific requirements for disclosure. Consequently, the credibility of information in SAR is questionable (Lodhia, 2004). Moreover, Gibson and O'Donovan (2007) and Holland and Foo (2003) suggest that the introduction of SARs dose not impact on the extent of environmental disclosures in annual reports. Hence, SARs were excluded in this research. Secondly, website environmental disclosure was not analysed in this research because of its perceived lack of veracity which often engenders incertitude and a dubiety of credence. Thirdly, reporting media such as advertisements and brochures were also excluded in this research because the disclosures provided in advertisements and brochures lack performance reporting and are almost entirely narrative, with minuscule quantitative data provided (Tilt, 2001). They are considered as limited media for communication. Finally, news media was excluded because there is the possibility that it serves a dual role for corporate environmental communication, for example, environmental information is covered by news media in prior periods and disclosed in subsequent annual reports (O'Donovan, 1999). Hence, this study exclusively analysed environmental disclosures in annual reports.

A longitudinal approach was employed to examine changes in environmental disclosures because "time series or longitudinal analyses describe more information on the developments of environmental disclosures" (Yusoff, Yatim, & Nasir, 2005, p. 53). This study covered a period of four financial years from 2007 to 2010. The main justification for choosing this four-year period was to facilitate a comparative study on the development of environmental disclosure made after the introduction of the G3 Guidelines.

Population

The population for this study was obtained from the Fin Analysis database held by the Edith Cowan University library. This database was chosen because it contains detailed financial information of corporations listed on the Australian Stock Exchange (ASX). The Fin Analysis identifies the mineral mining industry as a sub-sector of “metal and mining” under an industry sector named “materials”. As a result, a total population of 703 Australian listed mineral mining companies were identified from the “metal and mining” sub-sector on the Fin Analysis database.

Sample Selection

The sample was drawn from the population of 703 Australian listed mineral mining companies listed on the Fin Analysis database. Since the G3 Guidelines were released in late 2006, for the purpose of this study, data was collected for the financial years 2007, 2008, 2009 and 2010. The financial year considered in this study refers to the year beginning July 1 and concluding June 30 of the following year because this financial year time frame reflects the reporting years used by the Australian mineral mining companies. From the population of 703 companies, a systematic random sample of 100 Australian mineral mining companies, which had their annual reports for 2007, 2008, 2009 and 2010 available on the Fin Analysis database, were extracted. Meanwhile, the sample companies’ additional information relating to company size, rate of return, effective tax rate, market share, and number of shareholders was also extracted from the database.

Companies with SARs during 2007 to 2010 were excluded from this study because they are more likely to disclose environmental information in their SARs than the annual reports. Within the initial random sample of 100 companies, SARs such as separate environmental reports and separate sustainability reports were checked through the sample companies’ websites and the companies’ announcements published in the ASX website, where the SARs were possibly provided. Moreover, phone calls were also made to each company for checking SARs. Finally, in the initial sample, there were four companies providing SARs, which were Fortescue Metals Group Ltd, Kingsgate Consolidated Limited, OneSteel Limited, and Troy Resources NL. These companies were excluded and randomly replaced by other companies that did not have SARs during 2007 to 2010.

To sum up, the sample selection is based on the following criteria:

1. Companies must be listed on the ASX.
2. Companies must belong to the mineral mining industry.
3. Companies must have published their 2007, 2008, 2009 and 2010 annual reports and be available on the Fin Analysis database.
4. Companies must not have SARs during 2007 to 2010.

Data Collection and Recording Method

Data was collected by visually reviewing the selected companies' annual reports over the financial years 2007 to 2010 on the Fin Analysis database. An unweighted dichotomous index was employed to collect data. The dichotomous index has been used in numerous prior studies on environmental disclosures (Cooke, 1989; Filipovic, 2006; Guenther et al., 2006; Perez & Sanchez, 2009). The reason for choosing it is that the study is concerned with the quantity of the environmental performance indicators reported by the Australian mineral mining companies rather than the company's importance on disclosed items; using the unweighted index can avoid subjectivity inherent in weighting the information (Giner, 1997).

Using the dichotomous index, each company's annual reports over the financial year 2007 to 2010 was scored against each of the GRI environmental indicators. An indicator was scored as "1" if it was found in the report. Otherwise the indicator was scored as "0." The score of each individual indicator for each company in each year was recorded on a spreadsheet and added to provide an overall score of the level of environmental disclosure for each company in each year, and an overall score of the number of disclosing companies for each indicator in each year.

Independent Check of Content

The weakness of content analysis is that it relies on a single researcher to code the data that is mutually exclusive (Krippendorff, 2004). According to Krippendorff (2004), to overcome the weakness, one of the most used ways is to employ one or more individual researchers independently on the same set of data. Consequently, an independent person with experience on the use of content analysis was employed to recheck a sample of annual reports. The selected independent person, who is currently undertaking a Masters in voluntary environmental disclosure using content analysis, was considered to be highly suited for this role.

A systematic random sample of 20 companies (20%) in each year was considered reasonable for this study. Hence, the total number of annual reports verified by the independent person over the four years was 80. The results showed a 100% agreement in content analysis. In conclusion, the implementation of an independent check overcame the weakness in content analysis as suggested by Krippendorff (2004).

Definitions of Variables

The measure for the dependent variable of total voluntary environmental disclosure of GRI (the G3 Guidelines) information (ENGRI) was the dichotomous index.

The variables for company size (SIZE), rate of return on assets (RR), effective tax rate (ETR), and market share (MKS), were measured as per the Fin Analysis Database. The measure for company size (SIZE) was total assets; the measure for the rate of return on assets was $[\text{Net Income} + \text{Interest Expense} \times (1 - \text{Corporate Tax Rate})] / [\text{Total Assets} - \text{Outside Equity Interests}]$; the measure for effective tax rate was income tax expenses divided by net income before abnormals and tax; the measure for market share were firm sales divided by total sales of the industry to which the firm belongs.

The information of the variable number of shareholders (SHHLD) was collected from the sample companies' 2010 annual report. The measure for this variable was total number of ordinary shareholders. Table 5.1 presents the variable definitions and the expected direction.

Table 5.1

Variable Definitions

Variable	Expected sign	Measures
<u>Dependent variable</u>		
1. ENGRI	N/A	Dichotomous index
<u>Independent variables</u>		
1. SIZE	+	Total assets
2. RR	+	[Net Income + Interest Expense*(1-Corporate Tax Rate)]/[Total Assets - Outside Equity Interests]
3. ETR	+	Income tax expenses divided by net income before abnormals and tax
4. MKS	+	Firm sales divided by total sales of the industry to which the firm belongs
5. SHHLD	+	Number of ordinary shareholders

Data Analysis

The data that had been collected was analysed using a computer Statistical Program for Social Science (SPSS, 2010). Descriptive statistics were used to analyse the level and type of environmental disclosure in each designated year by providing information on frequency and percentage of occurrences. The study also employed a longitudinal approach to examine changes in environmental disclosures. Specifically, Wilcoxon signed-rank tests were used to analysis the changes between 2007 and 2008, 2008 and 2009, 2009 and 2010, and between 2007 and 2010. These methods of analysing the data ensured that the first objective of measuring the changes in environmental reporting over 2007-2010, in terms of volume and type of information disclosed using GRI index, was achieved.

In the second stage, univariate and multivariate methods were employed to test the relationship between the independent variables and the likelihood of voluntary reporting of environmental issues. Applying univariate analysis, also known as exploratory data analysis, prior to the multivariate analysis could help to identify the pattern of each independent variable (Jobson, 1991) and the possibility of multicollinearity (Field,

2009). In the univariate analysis, Pearson Correlation was employed to detect the existence of multicollinearity and to test the relationship between the dependent variable EDGIR and each of the independent variables. The focus, however, was on the multivariate analysis. Hand and Taylor (1987) and Scott (1991) argue that multivariate analysis is appropriate if there might be inter-dependence amongst the independent variables. As a result, in this research, ordinary least squares regression, to be more specific, a stepwise regression analysis was employed to test the hypotheses for the financial year 2010 and to explain the key determinants of environmental reporting. This test is useful when an independent variable is explained by multiple variables (Basilevsky, 1994; Hair, Anderson & Tatham, 1987; Studenmund, 2006). The model tested can be expressed as follows:

$$EDGRI = \beta_0 + \beta_1 \text{ SIZE} + \beta_2 \text{ RR} + \beta_3 \text{ ETR} + \beta_4 \text{ MKS} + \beta_5 \text{ SHHLD} + e_i$$

Where

- EDGRI is total voluntary environmental disclosure of GRI (the G3 Guidelines) information
- β_0 is a constant value
- β_n represents the coefficient of predictive values
- e_i is a residual value

Summary

In this chapter, research design, population, sample selection, data collection and recording method, definitions of the relevant variables, and statistical methods for the study have been elaborated. The next chapter will present analysis of environmental disclosure and provide results for the first objective of this study, which is to evaluate the changes in the level and type of voluntary environmental disclosure by Australian listed mineral mining companies in their annual reports during 2007 to 2010.

CHAPTER 6

ENVIRONMENTAL DISCLOSURE ANALYSIS

Introduction

This chapter presents environmental disclosure analysis using the research methodology outlined in the previous chapter. Descriptive statistics were applied to measure both the level and type of environmental reporting using the G3 index in 2007, 2008, 2009 and 2010; Wilcoxon signed-rank tests were conducted to evaluate the significance of the changes during 2007 to 2010. In addition, the quality of the environmental disclosures were also analysed in this chapter. All statistical results were generated using the Statistical Program for Social Science (SPSS) version 18.

Level of Environmental Reporting

Table 6.1 presents the number of Australian listed mineral mining companies disclosing environmental information in their annual reports during the financial years 2007 to 2010. Overall, there was an increase of 10% in the number of companies disclosing environmental information in their annual reports from 2007 to 2010. In 2010, half of the sample companies disclosed environmental information in their annual reports. As to the changes during 2007 to 2010, the first period (2007-2008) experienced a substantial increase of 11% in the number of disclosing companies. In the second and third period (2008-2009; 2009-2010), the number of disclosing companies changed little, with a drop of 5% and a growth of 4% respectively. The results indicate an increasing number of companies were disclosing environmental information in their annual reports, particularly during 2007 to 2008.

Table 6.1

The level of environmental disclosure in Australian listed mineral mining companies from 2007 to 2010

	2007		2008		2009		2010	
	No. of Companies	%	No. of Companies	%	No. of Companies	%	No. of Companies	%
Non disclosing companies	60	60	49	49	54	54	50	50
Disclosing companies	40	40	51	51	46	46	50	50
Total	100	100	100	100	100	100	100	100

Note: N=100;

The financial year considered in this study is the year beginning July 1 and concluding June 30 of the following year.

There was a substantial increase of 48% in the total number of environmental disclosures by Australian listed mineral mining companies from 2007 to 2008, and slight increases during the next two periods (2008-2009; 2009-2010), of 3% and 1% respectively (as indicated in Table 6.2). Although data from this table illustrates a trend of constant rise in the total number of environmental disclosures from 2007 to 2010, it does not indicate a high level (extent of reporting) of environmental disclosure. This is demonstrated in Table 6.2, which shows low means (0.92, 1.36, 1.40, 1.42) and the range of disclosures (0-10, 0-11, 0-12, 0-11) for the Australian listed mineral mining companies during the study period.

Table 6.2

Descriptive statistics of environmental disclosures from 2007 to 2010 - Raw Data

Year	Increase from Previous Year	Mean	Std. Deviation	Range
2007		0.920	1.612	0-10
2008	48%	1.360	2.033	0-11
2009	3%	1.400	2.211	0-12
2010	1%	1.420	2.051	0-11

Note: N=100;

The maximum possible range is 30, which is the total amount of environmental performance indicators as per the G3 Guidelines.

Significance of Changes

Wilcoxon signed-rank tests were conducted to evaluate whether the increases in environmental disclosures during 2007 to 2010 identified by the descriptive statistics in Table 6.2 were significant. The one-tailed Wilcoxon test (Table 6.3) confirmed a significant increase ($p<0.001$) in environmental disclosures in the companies' annual reports in 2008 compared to 2007. Even though there was an increase in the average number of disclosures from 2008 to 2009 as indicated in Table 6.2, the one-tailed Wilcoxon test (Table 6.4) did not show any significant difference ($p>0.05$). A similar pattern occurred in the changes between 2009 and 2010. Descriptive statistics results in Table 6.2 showed that the average number of environmental disclosures increased from 2009 to 2010. The observed change, however, was not significant ($p>0.05$) as illustrated in Table 6.5. Furthermore, the descriptive statistics results in Table 6.2 also indicated an overall growth in the average number of environmental disclosures from 2007 to 2010. This increase was identified as significant ($p<0.001$) by the one-tailed Wilcoxon test as revealed in Table 6.6.

Table 6.3
Wilcoxon signed-rank test for the change in total quantity of environmental disclosure from 2007 to 2008

	Increase (N)	Decrease (N)	Ties (N)	Total (N)	Z	P
2007-2008	31	10	59	100	-3.47	0.0005*
Mean rank change	16.80	22.35				

* $P<0.001$ (one-tailed)

Table 6.4
Wilcoxon signed-rank test for the change in total quantity of environmental disclosure from 2008 to 2009

	Increase (N)	Decrease (N)	Ties (N)	Total (N)	Z	P
2008-2009	18	19	63	100	-0.398	0.3455
Mean rank change	17.16	20.94				

Table 6.5

Wilcoxon signed-rank test for the change in total quantity of environmental disclosure from 2009 to 2010

	Increase (N)	Decrease (N)	Ties (N)	Total (N)	Z	P
2009-2010	23	21	56	100	-0.036	0.4855
Mean rank change	23.43	21.65				

Table 6.6

Wilcoxon signed-rank test for the change in total quantity of environmental disclosure from 2007 to 2010

	Increase (N)	Decrease (N)	Ties (N)	Total (N)	Z	P
2007-2010	36	15	49	100	-3.219	0.0005*
Mean rank change	27.75	21.80				

*P<0.001 (one-tailed)

Changes of Environmental Disclosures by Categories

In the GRI index, thirty environmental performance indicators are grouped into nine categories, which are “Materials”, “Energy”, “Water”, “Biodiversity”, “Emissions, Effluents, and Waste”, “Products and Services”, “Compliance”, “Transport”, and “Overall”. The detailed classification and descriptive statistics are presented in Table 6.7. Notably, the “Overall” category contains only the EN30 indicator, which requires companies to disclose on “total environmental protection expenditures and investments by type” (GRI, 2006, p. 29). Since the dichotomous index was employed in this study, the number of companies disclosing each indicator is equal to the number of disclosures in each indicator.

Figure 6.1, which illustrates the number of companies disclosing environmental information by categories, is conducted based on the results from Table 6.7. Except for the category “Transport”, which had no disclosure by any company throughout the whole period, the remaining eight categories all experienced some fluctuations in number of disclosing companies during 2007 to 2010.

During 2007 to 2008, categories of “Materials”, “Energy”, “Water”, “Biodiversity”, “Emissions, Effluents, and Waste”, “Products and Services”, “Compliance”, “Transport”, and “Overall” increased in terms of number of disclosing companies. This result indicates that an increasing number of companies realized the importance of environmental disclosure in all categories except “Transport” during 2007 to 2008.

During 2008 to 2009, “Overall”, “Energy”, and “Materials” increased constantly in number of disclosing companies. “Water”, “Biodiversity”, “Compliance”, and “Products and Services”, however, decreased during this period. Interestingly, the category “Emissions, Effluents, and Waste” remained unchanged during this period. The results during 2008 to 2009 indicate that fewer companies considered “Water”, “Biodiversity” and “Products and Services” as important disclosure categories.

During 2009 to 2010, “Compliance” remained at zero in number of disclosing companies. “Energy” and “Emissions, Effluents, and Waste” decreased during this period. The remaining six categories increased for the number of disclosing companies during this period. The results indicate that an increasing number of companies realised the importance of environmental disclosure in all categories except for “Energy” and “Emissions, Effluents, and Waste”.

In general, an increasing number of companies regarded “Overall”, “Materials”, “Energy”, “Water”, “Biodiversity”, “Emissions, Effluents, and Waste” and “Products and Services” as important categories in terms of environmental disclosure during 2007 to 2010. “Transport” and “Compliance” categories were not considered as important.

Environmental disclosures by categories from 2007 to 2010

Category	No. of companies disclosing				No. Of disclosures				Mean Disclosures				Std. Deviation				Range			
	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
EN1	10	12	14	17	10	12	14	17												
EN2	0	1	2	0	0	1	2	0												
Materials	10	12	15	17	10	13	16	17	0.10	0.13	0.16	0.17	0.3	0.37	0.4	0.38	0-1	0-2	0-2	0-1
EN3	12	14	12	12	12	14	12	12												
EN4	10	9	14	10	10	9	14	10												
EN5	1	3	3	1	1	3	3	1												
EN6	2	1	2	2	2	1	2	2												
EN7	0	0	0	0	0	0	0	0												
Energy	17	20	24	18	25	27	31	25	0.25	0.27	0.31	0.25	0.64	0.63	0.65	0.63	0-4	0-4	0-4	0-4
EN8	12	16	14	18	12	16	14	18												
EN9	0	0	1	0	0	0	1	0												
EN10	1	3	2	1	1	3	2	1												
Water	13	18	15	18	13	19	17	19	0.13	0.19	0.17	0.19	0.34	0.42	0.43	0.42	0-1	0-2	0-2	0-2
EN11	1	1	1	1	1	1	1	1												
EN12	1	0	1	2	1	0	1	2												
EN13	1	1	1	0	1	1	1	0												
EN14	3	15	11	15	3	15	11	15												
EN15	1	1	2	1	1	1	2	1												
Biodiversity	5	16	12	15	7	18	16	19	0.07	0.18	0.16	0.19	0.36	0.46	0.49	0.51	0-3	0-3	0-3	0-3
EN16	1	1	3	4	1	1	3	4												
EN17	0	0	0	0	0	0	0	0												
EN18	3	5	5	4	3	5	5	4												
EN19	0	0	0	0	0	0	0	0												
EN20	0	0	0	0	0	0	0	0												
EN21	3	4	5	3	3	4	5	3												
EN22	11	14	16	14	11	14	16	14												

Table 6.7 cont'd

Category	No. of companies disclosing				No. Of disclosures				Mean Disclosures			Std. Deviation			Range			
	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2007	2008	2009	2007	2008	2009	2010
EN23	0	0	0	0	0	0	0	0										
EN24	0	0	0	0	0	0	0	0										
EN25	0	0	0	0	0	0	0	0										
Emissions, Effluents, and Waste	16	20	20	19	18	24	29	25	0.18	0.24	0.29	0.25	0.46	0.53	0.67	0.58	0-3	0-3
EN26	5	13	8	11	5	13	8	11										
EN27	0	0	0	0	0	0	0	0										
Products and Services	5	13	8	11	5	13	8	11	0.05	0.13	0.08	0.11	0.22	0.34	0.27	0.31	0-1	0-1
EN28	0	1	0	0	0	1	0	0										
Compliance	0	1	0	0	0	1	0	0	0.00	0.01	0.00	0.00	0.000	0.100	0.000	0.000	0	0
EN29	0	0	0	0	0	0	0	0										
Transport	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0	0
EN30	14	21	23	26	14	21	23	26										
Overall	14	21	23	26	14	21	23	26	0.14	0.21	0.23	0.26	0.35	0.41	0.42	0.44	0-1	0-1

Note: For a full description of above indicators and categories, refer to Table 2.1 on pages 9-11.

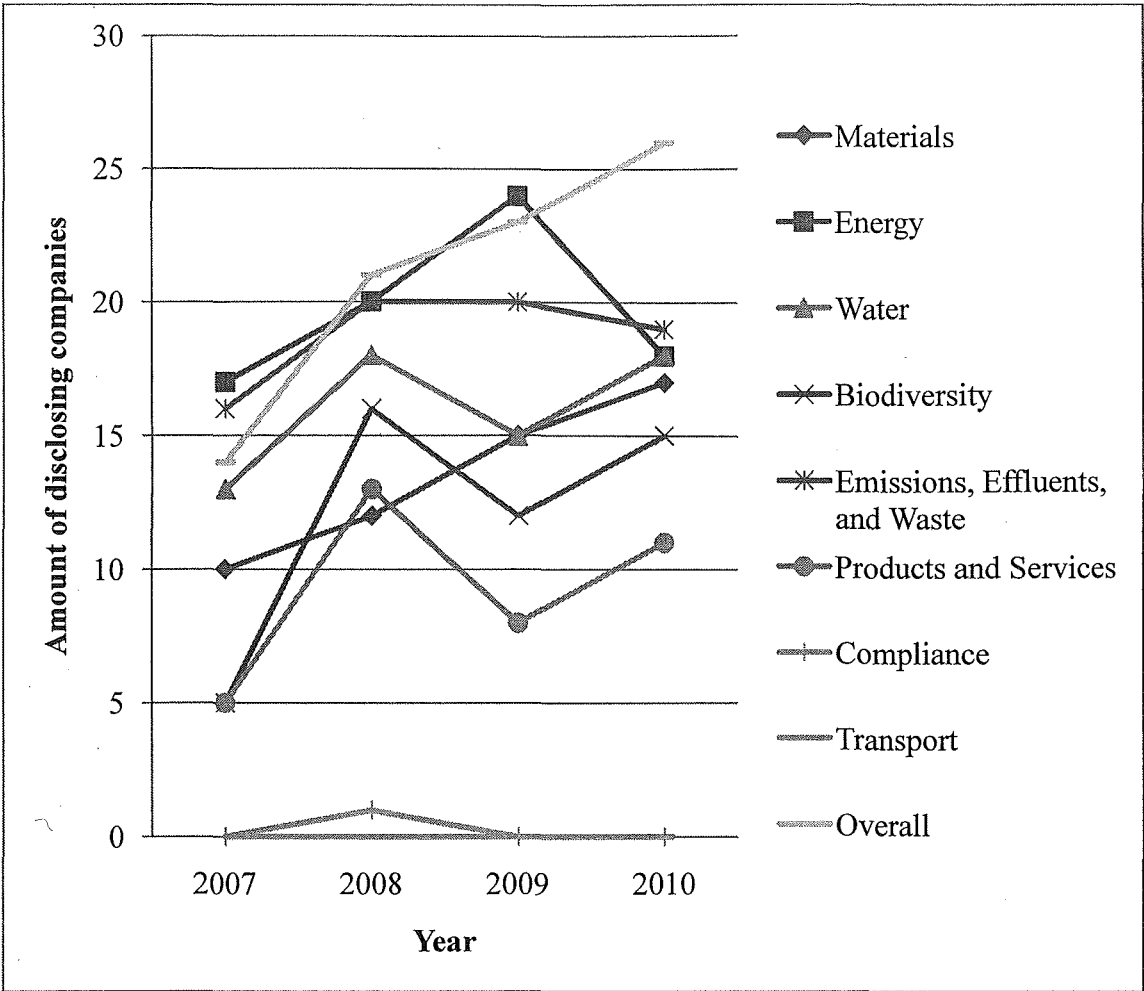


Figure 6.1
Total quantity of disclosing companies by year from 2007 to 2010
Note: For a full description of above categories, refer to Table 2.1 on pages 9-11.

Figure 6.2, which presents the average number of environmental disclosures by category, is conducted based on the results from Table 6.7. During 2007 to 2008, except for the category “Transport”, which was zero, all other eight categories experienced growth in average number of disclosures. This result indicates that except for “Transport”, sample companies realized the importance of environmental disclosure in all categories and increased the number of disclosures during 2007 to 2008.

During 2008 to 2009, the level of importance in “Energy”, “Emissions, Effluents and Waste”, “Overall”, and “Materials” categories increased as the average number of disclosures in these four categories rose constantly during this period. However, the figures in “Water”, “Biodiversity”, “Products and Services”, and “Compliance” decreased during this period, which indicate that these categories were considered as less important compared to the period 2007 to 2008.

During 2009 to 2010, companies improved their disclosures in “Overall”, “Water”, “Biodiversity”, “Materials” and “Products and Services” as the average number of disclosures in these categories rose from 2009 to 2010. In general, the average number of disclosures by category increased from 2007 to 2010 except for “Energy”, “Transport” and “Compliance”. It indicates that except for “Energy”, “Transport” and “Compliance” categories, sample companies increased the level of importance in terms of environmental disclosure, and improved the number of disclosures throughout the whole period.

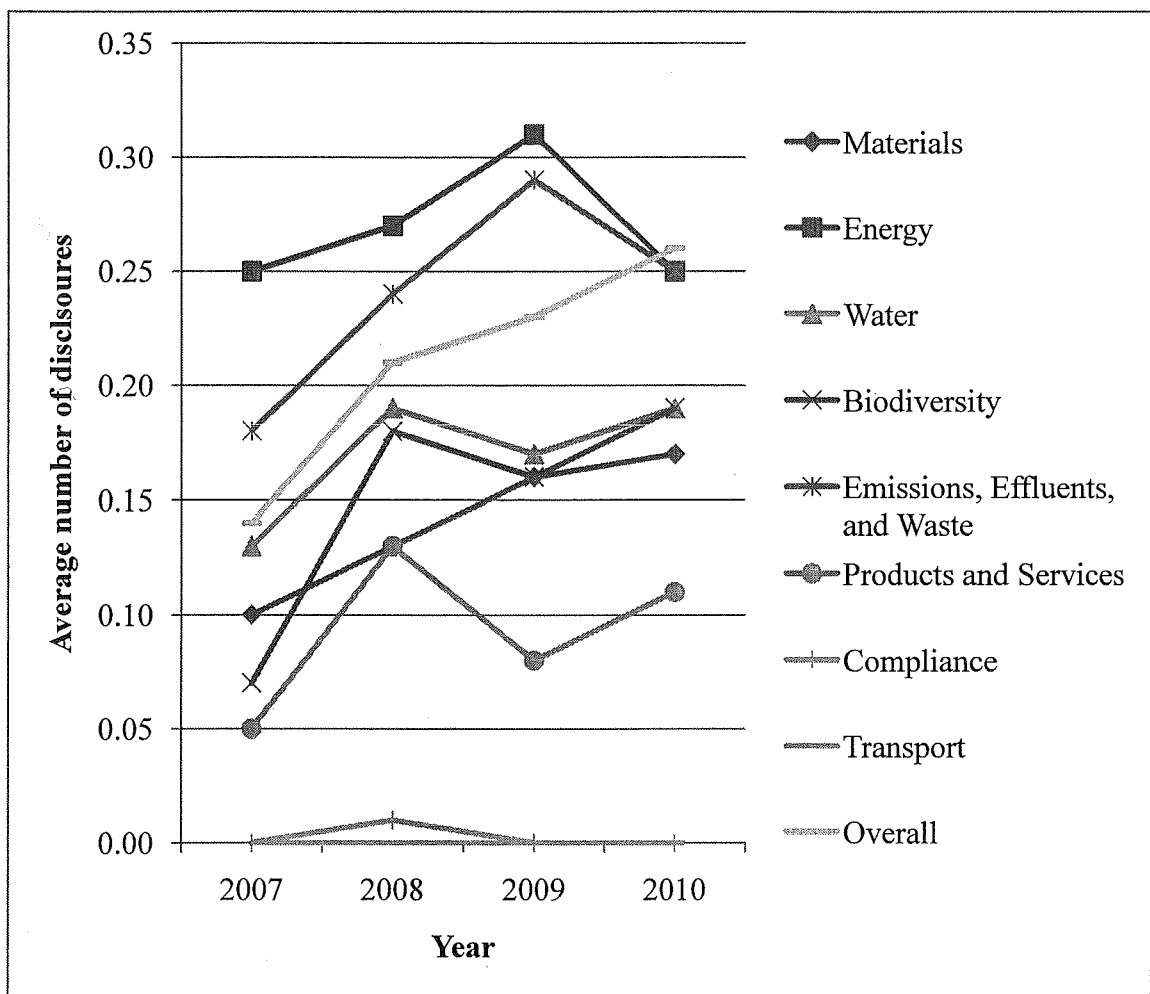


Figure 6.2
Average number of disclosures by year from 2007 to 2010
Note: For a full description of above categories, refer to Table 2.1 on pages 9-11.

Most Common Reported Categories

The four most common categories reported by sample companies are provided in Table 6.8. Only four categories are considered because they ranked as the top four in terms of both percentage of disclosing companies and average number of disclosures in each designated year, though rank orders differed in each year and in different standards of measurement. During 2007 to 2010, the most common reported GRI environmental performance categories were “Energy”, “Emissions, Effluents, and Waste”, “Water”, and “Overall”. This indicates that sample companies consider these categories as important in terms of environmental disclosure. Notably, the category “Water” ranked quite low compared to the other three categories throughout the whole period. The category “Energy”, however, ranked almost as top one during the study period. It indicates that, in their annual reports, sample companies regarded “Energy” as the most important category to be reported.

Table 6.8
Top 4 GRI categories

2007

GRI Performance Category	Rank (% of companies disclosing)	Rank (Average No. of disclosures per company)
Energy (EN2-7)	1 (17%)	1 (0.25)
Emissions, Effluents, and Waste (EN16-25)	2 (16%)	2 (0.18)
Overall (EN30)	3 (14%)	3 (0.14)
Water (EN8-10)	4 (13%)	4 (0.13)

2008

GRI Performance Aspect	Rank (% of companies disclosing)	Rank (Average No. of disclosures per company)
Overall (EN30)	1 (21%)	3 (0.21)
Energy (EN2-7)	2 (20%)	1 (0.27)
Emissions, Effluents, and Waste (EN16-25)	2 (20%)	2 (0.24)
Water (EN8-10)	4 (18%)	4 (0.19)

Table 6.8 (Cont'd.)

2009		
GRI Performance Aspect	Rank (% of companies disclosing)	Rank (Average No. of disclosures per company)
Energy (EN2-7)	1 (24%)	1 (0.31)
Overall (EN30)	2 (23%)	3 (0.23)
Emissions, Effluents, and Waste (EN16-25)	3 (20%)	2 (0.29)
Water (EN8-10)	4 (15%)	4 (0.17)
2010		
GRI Performance Aspect	Rank (% of companies disclosing)	Rank (Average No. of disclosures per company)
Overall (EN30)	1 (26%)	1 (0.26)
Emissions, Effluents, and Waste (EN16-25)	2 (19%)	2 (0.25)
Energy (EN2-7)	3 (18%)	2 (0.25)
Water (EN8-10)	4 (18%)	4 (0.19)

Note: For a full description of above categories, refer to Table 2.1 on pages 9-11.

Most Common Indicators

Table 6.9 presents rank orders of the thirty environmental indicators for each designated year. Since the dichotomous index was employed in this study, the number of companies disclosing each indicator is equal to the number of disclosures in each indicator. Hence, the percentage of disclosing companies is equal to the average number of disclosures per company, as reflected in Table 6.9. As can be seen from the table, during 2007 to 2010, the most reported indicator was EN30, which requires companies to disclose on “total environmental protection expenditures and investments by type” (GRI, 2006, p. 29).

Besides EN30, sample companies also commonly reported on EN1, which requires companies to report on “materials used by weight or volume” (GRI, 2006, p. 28); EN3, which requires companies to report on “direct energy consumption by primary energy source” (GRI, 2006, p. 28); EN4, which requires companies to report on “indirect

energy consumption by primary source” (GRI, 2006, p. 28); EN8, which requires companies to report on “total water withdrawal by source” (GRI, 2006, p. 28); EN14, which requires companies to report on “strategies, current actions, and future plans for managing impacts on biodiversity” (GRI, 2006, p. 28); EN22, which requires companies to report on “Total weight of waste by type and disposal method” (GRI, 2006, p. 28); and EN26, which requires companies to report on “Initiatives to mitigate environmental impacts of products and services, and extent of impact mitigation” (GRI, 2006, p. 29). These indicators ranked within the top eight during 2007 to 2010 though rank orders differed slightly in each year.

The remaining indicators are regarded as being less important as the top eight because those indicators are close to zero in terms of both percentage of disclosing companies and average number of disclosures. A possible reason for zero disclosure on those indicators may be that when some major companies do not disclose information regarding those indicators, others may choose not to.

Quality of Disclosures

When there are disclosures by sample companies, it is important to evaluate the quality of those disclosures (Table 6.10). Three levels of quality disclosure are identified, which are 1%, 50% and 100%. The level of 1% means companies only mentioned a general aspect regarding each indicator in their annual reports; the level of 50% reflects the content of relevant indicator disclosure matched half of the description identified in the G3 Guidelines; the level of 100% indicates companies disclosed information of the relevant indicator as per the G3 Guidelines.

Overall, the number of disclosures at the 50% level was quite low, with less than 15% at this level during the study period, though there was a slight increase of 2% from 2007 to 2010. The same situation occurs with the number at the 100% level. Although there was a growth of 4% in the number of disclosures from 2007 to 2010, the figures were still low, with less than 30% of disclosures being fully described environmental items based on the G3 Guidelines. Moreover, over 50% of disclosures were at the 1% level during 2007 to 2010. During 2007 to 2010, companies provided more quality disclosures in categories “Materials” and “Products and Services”, with over 80% and 100% of the disclosures at the 100% level, respectively.

Table 6.9
Rank of environmental indicators

Year 2007				Year 2008				Year 2009				Year 2010			
Rank	GRI indicator	% of companies disclosing	Average number of disclosures	Rank	GRI indicator	% of companies disclosing	Average number of disclosures	Rank	GRI indicator	% of companies disclosing	Average number of disclosures	Rank	GRI indicator	% of companies disclosing	Average number of disclosures
1	EN30	14	0.14	1	EN30	21	0.21	1	EN30	23	0.23	1	EN30	26	0.26
2	EN3	12	0.12	2	EN8	16	0.16	2	EN22	16	0.16	2	EN8	18	0.18
2	EN8	12	0.12	3	EN14	15	0.15	3	EN1	14	0.14	3	EN1	17	0.17
4	EN22	11	0.11	4	EN3	14	0.14	3	EN4	14	0.14	4	EN14	15	0.15
5	EN1	10	0.1	4	EN22	14	0.14	3	EN8	14	0.14	5	EN22	14	0.14
5	EN4	10	0.1	6	EN26	13	0.13	6	EN3	12	0.12	6	EN3	12	0.12
7	EN26	5	0.05	7	EN1	12	0.12	7	EN14	11	0.11	7	EN26	11	0.11
8	EN14	3	0.03	8	EN4	9	0.09	8	EN26	8	0.08	8	EN4	10	0.1
8	EN18	3	0.03	9	EN18	5	0.05	9	EN18	5	0.05	9	EN16	4	0.04
8	EN21	3	0.03	10	EN21	4	0.04	9	EN21	5	0.05	9	EN18	4	0.04
11	EN6	2	0.02	11	EN5	3	0.03	11	EN5	3	0.03	11	EN21	3	0.03
12	EN5	1	0.01	11	EN10	3	0.03	11	EN16	3	0.03	12	EN6	2	0.02
12	EN10	1	0.01	13	EN2	1	0.01	13	EN2	2	0.02	12	EN12	2	0.02
12	EN11	1	0.01	13	EN6	1	0.01	13	EN6	2	0.02	14	EN5	1	0.01
12	EN12	1	0.01	13	EN11	1	0.01	13	EN10	2	0.02	14	EN10	1	0.01
12	EN13	1	0.01	13	EN13	1	0.01	13	EN15	2	0.02	14	EN11	1	0.01
12	EN15	1	0.01	13	EN15	1	0.01	17	EN9	1	0.01	14	EN15	1	0.01
12	EN16	1	0.01	13	EN16	1	0.01	17	EN11	1	0.01	18	EN2	0	0
19	EN2	0	0	13	EN28	1	0.01	17	EN12	1	0.01	18	EN7	0	0
19	EN7	0	0	20	EN7	0	0	17	EN13	1	0.01	18	EN9	0	0
19	EN9	0	0	20	EN9	0	0	21	EN7	0	0	18	EN13	0	0
19	EN17	0	0	20	EN12	0	0	21	EN17	0	0	18	EN17	0	0

Table 6.9 *cont'd.*

Year 2007				Year 2008				Year 2009				Year 2010			
Rank	GRI indicator	% of companies disclosing	Average number of disclosures	Rank	GRI indicator	% of companies disclosing	Average number of disclosures	Rank	GRI indicator	% of companies disclosing	Average number of disclosures	Rank	GRI indicator	% of companies disclosing	Average number of disclosures
19	EN19	0	0	20	EN17	0	0	21	EN19	0	0	18	EN19	0	0
19	EN20	0	0	20	EN19	0	0	21	EN20	0	0	18	EN20	0	0
19	EN23	0	0	20	EN20	0	0	21	EN23	0	0	18	EN23	0	0
19	EN24	0	0	20	EN23	0	0	21	EN24	0	0	18	EN24	0	0
19	EN25	0	0	20	EN24	0	0	21	EN25	0	0	18	EN25	0	0
19	EN27	0	0	20	EN25	0	0	21	EN27	0	0	18	EN27	0	0
19	EN28	0	0	20	EN27	0	0	21	EN28	0	0	18	EN28	0	0
19	EN29	0	0	20	EN29	0	0	21	EN29	0	0	18	EN29	0	0

Note: For a full description of above indicators, refer to Table 2.1 on pages 9-11.

Table 6.10

Quality of the disclosures

	2007				2008				2009				2010			
	1%	50%	100%	% of disclosures at the 100% level	1%	50%	100%	% of disclosures at the 100% level	1%	50%	100%	% of disclosures at the 100% level	1%	50%	100%	% of disclosures at the 100% level
EN1	2	0	8		1	0	11		1	0	13		2	0	15	
EN2	0	0	0		0	0	0		2	0	0		0	0	0	
Material	2	0	8	80%	1	0	11	92%	3	0	13	81%	2	0	15	88%
EN3	11	0	1		13	0	1		11	0	1		11	0	1	
EN4	9	0	1		8	0	1		13	0	1		9	0	1	
EN5	0	0	1		2	0	1		2	0	1		0	0	1	
EN6	0	0	2		0	0	1		1	0	1		0	1	1	
EN7	0	0	0		0	0	0		0	0	0		0	0	0	
Energy	20	0	5	20%	23	0	4	15%	27	0	4	13%	20	1	4	16%
EN8	10	1	1		15	0	1		12	1	1		16	1	1	
EN9	0	0	0		1	0	0		1	0	0		0	0	0	
EN10	1	0	0		3	0	0		2	0	0		1	0	0	
Water	11	1	1	8%	19	0	1	5%	15	1	1	6%	17	1	1	5%
EN11	0	1	0		1	0	0		1	0	0		0	1	0	
EN12	1	0	0		0	0	0		0	0	1		0	0	2	
EN13	0	0	1		0	0	1		0	0	1		0	0	0	
EN14	0	2	1		0	14	1		0	9	2		0	12	3	
EN15	0	1	0		0	1	0		0	2	0		0	0	1	
Biodiversity	1	4	2	29%	1	15	2	11%	1	11	4	25%	0	13	6	32%
EN16	0	0	1		0	0	1		1	1	1		2	1	1	
EN17	0	0	0		0	0	0		0	0	0		0	0	0	
EN18	0	3	0		1	3	1		1	0	4		0	4	0	

Table 6.10 *cont'd.*

	2007					2008					2009					2010				
	1%	50%	100%	% of disclosures at the 100% level		1%	50%	100%	% of disclosures at the 100% level		1%	50%	100%	% of disclosures at the 100% level		1%	50%	100%	% of disclosures at the 100% level	
EN19	0	0	0			0	0	0			0	0	0			0	0	0		
EN20	0	0	0			0	0	0			0	0	0			0	0	0		
EN21	3	0	0			3	1	0			4	0	1			2	1	0		
EN22	5	4	2			8	2	4			9	2	5			8	2	4		
EN23	0	0	0			0	0	0			0	0	0			0	0	0		
EN24	0	0	0			0	0	0			0	0	0			0	0	0		
EN25	0	0	0			0	0	0			0	0	0			0	0	0		
Emissions, Effluents, and Waste	8	7	3	17%		12	6	6	25%		15	3	11	38%		12	8	5	20%	
EN26	0	0	5			0	0	13			0	0	8			0	0	11		
EN27	0	0	0			0	0	0			0	0	0			0	0	0		
Products and Services	0	0	5	100%		0	0	13	100%		0	0	8	100%		0	0	11	100%	
EN28	0	0	0			0	0	1			0	0	0			0	0	0		
Compliance	0	0	0	0%		0	0	1	100%		0	0	0	0%		0	0	0	0%	
EN29	0	0	0			0	0	0			0	0	0			0	0	0		
Transport	0	0	0	0%		0	0	0	0%		0	0	0	0%		0	0	0	0%	
EN30	13	1	0			21	0	0			22	0	1			25	0	1		
Overall	13	1	0	0%		21	0	0	0%		22	0	1	4%		25	0	1	4%	
TOTAL	55	13	24			77	21	38			83	15	42			76	23	43		
			92					136					140					142		
	60%	14%	26%			57%	15%	28%			59%	11%	30%			54%	16%	30%		

Note: For a full description of above indicators and categories, refer to Table 2.1 on pages 9-11.

Discussion of Results

The previous sections presented the descriptive statistical results from environmental disclosure analysis. As to the total quantity of companies disclosing environmental information in their annual reports, there was an increase of 10% from 2007 to 2010. In 2010, half of the sample companies disclosed environmental information in their annual reports. This indicates that an increasing number of Australian listed mineral mining companies were disclosing environmental information in their annual reports.

As for the total quantity of environmental disclosures by the sample companies, there was a substantial increase of 52% from 2007 to 2010. The substantial increase in the number of disclosures during 2007 to 2008, slight increases during 2008 to 2009 and during 2009 to 2010 may be explained by the impact of the global financial crisis on Australia's economy. Although the global financial crisis affected the Australia's economy in late 2007, it was visibly worse in September 2008; and the global financial crisis led to an economic crisis in Australia in early 2009 ("Defending Australia from the financial crisis", n.d.). This indicates that in Australia, the period from the financial years 2007 to 2008 could be regarded as a transitional period, and the economy growth was relatively stable during this period. Hence, there were still an increasing number of companies disclosing environmental performance information in their annual reports during 2007 to 2008. During the period of the financial years 2008 to 2010, Australia's economy was substantially affected by the global financial crisis. Both the organisations and the public tended to be more concerned with financial rather than non-financial issues. Therefore, the changes in the number of companies disclosing environmental information were not significant, with a slight increase of 4% during 2008 to 2010.

Although there was a trend of constant rise in the total number of environmental disclosures from 2007 to 2010, it does not indicate a high level (extent of reporting) of environmental disclosure in the Australian mineral mining industry, as companies only disclosed a narrow group of reporting elements from the GRI environmental performance indicators; the range of disclosures was around 10 from the total of 30 indicators during 2007 to 2008 and the average number of disclosures per company were close to one during the study period.

An increasing number of companies regarded "Overall", "Materials", "Energy", "Water", "Biodiversity", "Emissions, Effluents, and Waste" and "Products and Services" as important categories in terms of environmental disclosure from 2007 to

2010. Meanwhile, the total quantity of disclosures regarding these seven categories increased throughout the whole period. “Transport” and “Compliance” categories were not considered as important. Within the seven categories, indicators of EN1, EN3, EN4, EN8, EN14, EN22, EN26 and EN30, which are described in full in Table 2.1 on pages 9-11, are the top eight most common reported indicators. In addition, within those seven categories, “Energy”, “Emissions, Effluents, and Waste”, “Overall” and “Water” were the top four most common reported categories. Worldwide, the most common public concerns about environmental issues are energy consumption, greenhouse gas emissions, water pollution and land pollution (“Current environmental issues and news”, n.d.). Therefore, the results of the most common reported categories (Energy”, “Emissions, Effluents, and Waste”, “Water”, and “Overall”) indicate that companies prefer to disclose environmental information that relates to the public’s concerns.

Most sample companies (over 50%) preferred to disclose general environmental information in their annual reports rather than provide all relevant information as indicated in the GRI guidelines, and the quality of environmental disclosures is relatively low. In conclusion, most companies are still not willing to disclose their environmental issues in detail in their annual reports.

Summary

This chapter has presented and discussed the results from environmental disclosure analysis. The next chapter will test the hypotheses formulated in chapter 5 and discuss the results obtained from univariate analysis and multiple regression analysis.

CHAPTER 7

REGRESSION RESULTS ANALYSIS

Introduction

This chapter discusses the tests of five directional hypotheses formulated in chapter four using the methodology outlined in chapter five and presents the research findings. All tests were generated using the Statistical Program for Social Science (SPSS) version 18.

Descriptive Statistics

According to Tabachnick and Fidell (2007), multivariate procedures are based on assumptions, which are normality, linearity, independence of errors, constant variance of error terms, and non-collinearity; before proceeding multivariate analysis, it is essential to assess the fit between the data set and the assumptions. Hence, descriptive statistics were employed to examine the central tendency and the distribution of variables by calculating the mean, median, standard deviation, skewness and kurtosis. Table 7.1 presents these descriptive statistics of raw data for both dependent and independent variables.

For assessing normality of observed data, both graphical and non-graphical tests can be used (Stevens, 1992). However, it is argued that, non-graphical tests are more valuable than graphical tests; and within those non-graphical tests, “the combination of using skewness and kurtosis coefficient and the Shapiro-Wilk test were the most powerful in detecting departures from normality” (Stevens, 1992, p. 253). Unfortunately, the Shapiro-Wilk test is not applicable in this study because it is limited to samples within 50 observations (SPSS Inc., 1999). Hence, the Kolmogorov-Smirnov (K-S) test and examination of skewness and kurtosis coefficient were conducted to see if a distribution of observed data significantly differs from a normal distribution (Field, 2009).

From Table 7.1, it is apparent that the distributions of both dependent and independent variables departed from normality. With the exception of RR (rate of return on assets) that was skewed to the right (negative skewness), variables of ENGRI (total voluntary environmental disclosure of GRI information), SIZE (company size), ETR (effective tax rate), MKS (market share) and SHHLD (number of shareholders) were skewed to the left (positive skewness). The distributions of all variables were too peaked. To further investigate the normality, z-scores were conducted to test the significance of skewness

and kurtosis. A z-score was measured by a value of skewness/kurtosis divided by the standard error of skewness/kurtosis (Field, 2009; Tabachnick and Fidell, 2007). As suggested by Field (2009), if absolute z values are greater than 3.29 in very large samples, skewness/kurtosis are significant. As can be seen from Table 7.2, z values of all variables were greater than 3.29, which indicated the distribution of all variables departed from normality. Moreover, the K-S test was conducted for each of the dependent and independent variables as indicated in Table 7.2. It was confirmed that all of the variables departed from normal distributions.

Table 7.1
Descriptive Statistics - Raw Data

Variable	Mean	Median	Std. Deviation	Skewness	Kurtosis
ENGRI (d)*	1.420000	0.50000	2.0510000	1.888	4.341
SIZE \$ (m)**	120.796100	17.75000	455.6698000	7.873	69.180
RR (%)	-0.301966	-0.10485	0.4711177	-1.864	3.111
ETR (%)	0.061620	0.00000	0.1533673	2.173	6.683
MKS (%)	0.000537	0.00000	0.0039860	9.792	97.093
SHHLD (s)***	3211.310000	1792.00000	4179.3730000	3.133	11.200

Note: N = 100

* Proportion of disclosures (d) per company

** Proportion per million

*** Proportion of shareholders (s) per company

Table 7.2
Test of Normality

Variable	Z values		K-S test	
	Skewness	Kurtosis	Statistic	Sig.
ENGRI	7.834**	9.082**	0.261	0.000*
SIZE	32.668**	144.728**	0.396	0.000*
RR	7.734**	6.508**	0.207	0.000*
ETR	9.017**	13.981**	0.384	0.000*
MKS	40.631**	203.123**	0.446	0.000*
SHHLD	13.000**	23.431**	0.261	0.000*

* P < 0.05; ** Z > 3.29

Outliers and Linearity

Clearly, the distributions of both independent and dependent variables were not normal. By reviewing normal probability plots and scatter plots of each variable, univariate outliers were present, and the assumption of linearity was violated. Four methods can be used to eliminate outliers; the methods include checking accuracy of data entry, specifying missing value codes, deleting outliers, and changing the value on variables (Tabachnick & Fidell, 2007). Data was checked to determine the existence of coding errors or missing data, no such errors were detected. Tabachnick and Fidell (2007) suggest that when there are both non-normal variables and potential univariate outliers, transformation of variables is preferable compared to choices of deleting outliers or changing the value on variables. The violation of the assumption of linearity can also be improved or eliminated by data transformation.

Homoscedasticity and Independence of Errors

To test the assumption of homoscedasticity between the predicted dependent variable scores and errors of prediction, examination of residuals scatterplots was performed (Tabachnick & Fidell, 2007). The overall shape of the scatterplots presented a funnel, which indicates that the variance of error terms was not constant, thus violating homoscedasticity. To detect the assumption of independence of errors, the Durbin-Watson test was undertaken (Field, 2009; Neter, Wasserman & Kutner, 1990). The adjacent residuals are correlated when a value from the test statistic is greater or smaller than 2 (Field, 2009), and in this case the result (1.976) was very close to 2. Hence, the assumption of independence of errors was not violated. The violation of the assumptions can also be improved or eliminated by data transformation.

Transformation of Data

Transformations were undertaken to rectify the outliers and improve the normality of distributions. According to Tabachnick and Fidell (2007), a square root transformation should be tried first if the distribution differs moderately from normality; a log transformation should be tried if the distribution differs substantially; and an inverse transformation (also known as reciprocal transformation) should be tried if the distribution differs severely. Transformations were performed for both dependent and independent variables in this study. This is presented in Table 7.3.

As the distributions of the observed data for variables ENGRI (total voluntary environmental disclosure of GRI information), SIZE (company size), MKS (market share) and SHHLD (number of shareholders) were substantially positive skewed, a log transformation was employed; and variable ETR (effective tax rate) was severely positive skewed, hence a reciprocal transformation was employed. Prior to the transformations, variables ENGRI (total voluntary environmental disclosure of GRI information), ETR (effective tax rate) and MKS (market share) all presented lowest values of zero, and variable SIZE (company size) contained a value less than one, hence, one was added for each variable to avoid taking the log and inverse of zero (Tabachnick & Fidell, 2007). The distribution for independent variable RR (rate of return on assets) was severely negative skewed, and a reciprocal transformation was employed. Prior to the transformation, the variable was converted to one with positive skewness by subtracting each score from one to avoid taking the inverse of zero (Tabachnick & Fidell, 2007).

Table 7.3
Data Transformation

Variable	Transformation
ENGRI	Log: LG10 (ENGRI + 1)
SIZE	Log: LG10 (SIZE +1)
RR	Reciprocal: 1 / (1 - RR)
ETR	Reciprocal: 1 / (ETR + 1)
MKS	Log: LG10 (MKS + 1)
SHHLD	Log: LG10 (SHHLD + 1)

As can be seen from Table 7.4, both skewness and kurtosis were reduced and the distributions were closer to normal. Z values of skewness and kurtosis and the K-S test were run again to examine the normality of the transformed data (Table 7.5). It is found that variables ETR (effective tax rate) and MKS (market share) still fall outside normality based on the results from the K-S test and z values assessment. However, the mean and median for each of those variables are relatively close together. Therefore, it is assumed that all variables after the transformation of data are approaching normality.

Table 7.4
Descriptive Statistics - Data Transformation

Variable	Mean	Median	Std. Deviation	Skewness	Kurtosis
LgENGRI	0.265100	0.1505	0.30591	0.714	-0.804
LgSIZE	1.396800	1.2730	0.67143	0.772	0.484
RecRR	0.841200	0.9051	0.22151	-0.101	1.559
RecETR	0.958200	1.0000	0.11925	0.335	10.091
LgMKS	0.000230	0.0000	0.00170	9.784	96.987
LgSHHLD	3.285600	3.2536	0.42047	0.397	-0.011

Note: N = 100

Table 7.5
Test of Normality

Variable	Z values		K-S test	
	Skewness	Kurtosis	Statistic	Sig.
ENGRI	2.963	1.682	0.307	0.000*
SIZE	3.203	1.013	0.083	0.083
RR	0.419	3.262	0.133	0.000*
ETR	1.390	21.111**	0.361	0.000*
MKS	40.598**	202.902**	0.446	0.000*
SHHLD	1.647	0.023	0.067	0.200

* P < 0.05; ** Z > 3.29

Univariate Statistics

Before multivariate analysis, univariate analysis was employed to provide information about the significance of each variable, the strength of the relationship between the dependent variable and each of the independent variables (Cohen, 1988; Mason & Lind, 1996; Stevens, 1992), and the possibility of multicollinearity (Field, 2009).

Test of Multicollinearity in a Univariate Setting

A problem that may arise in multivariate analysis is the presence of multicollinearity. Severe constraints on the regression coefficient can be generated when multicollinearity exists (Stevens, 1992). In a univariate setting, multicollinearity can be detected by scanning a correlation matrix of all of the independent variables; if correlations are above 0.80 or 0.90, multicollinearity exists (Field, 2009). Hence, Pearson Correlation was conducted to assess the existence of multicollinearity (Table 7.6). As can be seen from the table, all correlations are below 0.80; hence they do not contain a harmful level of multicollinearity.

Table 7.6

Test of Multicollinearity – Univariate

		LgSIZE	RecRR	RecETR	LgMKS	LgSHHLD
LgSIZE	Pearson Correlation	1				
	Sig. (1-tailed)	-				
RecRR	Pearson Correlation	0.573	1			
	Sig. (1-tailed)	0.000	-			
RecETR	Pearson Correlation	-0.312	-0.295	1		
	Sig. (1-tailed)	0.001	0.001	-		
LgMKS	Pearson Correlation	0.401	0.118	-0.229	1	
	Sig. (1-tailed)	0.000	0.121	0.011	-	
LgSHHLD	Pearson Correlation	0.704	0.398	-0.184	0.293	1
	Sig. (1-tailed)	0.000	0.000	0.033	0.002	-

Univariate Analysis

Pearson Correlation was conducted again to test the relationship between the dependent variable ENGRI (total voluntary environmental disclosure of GRI information) and each of the independent variables, which are SIZE (company size), RR (rate of return on assets), ETR (effective tax rate), MKS (market share) and SHHLD (number of shareholders). The results from Pearson Correlation are presented in Table 7.7.

According to Cohen (1988), there is a small or weak correlation between two variables if the absolute value of r falls between 0.10 and 0.299; there is a medium or moderate correlation between two variables if the absolute value of r falls between 0.30 and 0.499; there is a large or strong correlation between two variables if the absolute value of r falls between 0.50 and 1. As can be seen from Table 7.7, all independent variables have an individual relationship with the dependent variable ENGRI (total voluntary environmental disclosure of GRI information). Variable RR (rate of return on assets) ($r = 0.292$) has a weak positive relationship with the dependent variable ENGRI; variables ETR (effective tax rate) ($r = -0.350$) and MKS (market share) ($r = 0.306$) have a moderate positive relationship with the dependent variable ENGRI; variables SIZE (company size) and SHHLD (number of shareholders) have a strong positive relationship with the dependent variable ENGRI.

Cohen (1988) suggests that correlation of variables is statistically significant when the significance of correlation is at the 0.01 level for one-tailed test. The results from Pearson Correlation indicate that all independent variables ($p < 0.01$) are significantly associated with the dependent variable ENGRI (total voluntary environmental disclosure of GRI information) and all variables are in the expected direction.

Table 7.7
Results from Pearson Correlation

		Expected Sign	LgENGRI
LgSIZE	Pearson Correlation	+	0.619*
	Sig. (1-tailed)		0
RecRR	Pearson Correlation	+	0.292*
	Sig. (1-tailed)		0.002
RecETR	Pearson Correlation	-	-0.350*
	Sig. (1-tailed)		0
LgMKS	Pearson Correlation	+	0.306*
	Sig. (1-tailed)		0.001
LgSHHLD	Pearson Correlation	+	0.505*
	Sig. (1-tailed)		0

Note: * Correlation is significant at the 0.01 level (1-tailed);
 Since variable ETR was inversed during data transformation, relationship between independent variable RecETR dependent variable ENGRI was expected to be negative;
 Since direction of distribution for variable RR was reversed before data transformation, and variable RR was then inversed during transformation, relationship between independent variable RecRR and dependent variable ENGRI was still expected to be positive.

Multivariate Statistics

When there are two or more independent variables and they are all correlated with one another to varying degrees, multivariate statistics are the most suitable procedure to provide analysis (Brown, 1991; Stevens, 1992; Tabachnick & Fidell, 2007). Therefore, multivariate statistics was conducted to test the five directional hypotheses formulated in chapter four.

Testing of Multicollinearity in a Multivariate Setting

The presence of multicollinearity can affect the parameters of a regression model (Field, 2009; Stevens, 1992). To maintain the quality and stability of the multiple regression model developed, collinearity statistics were performed on the transformed data to test for multicollinearity. Multicollinearity can be detected from the magnitude of the variance inflation factor (VIF), which indicates “whether a predictor has a strong linear

relationship with the other predictor(s)” (Field, 2009, p. 224). Myers (1990) suggests that if any VIF is greater than 10 then the regression model may be biased by multicollinearity. Moreover, if the VIF values are close to one, a low level of multicollinearity is indicated (Bowerman & O’Connell, 1990). In addition, tolerance is also a good way to detect multicollinearity. It is the reciprocal of VIF (Field, 2009). According to Brown (1991) and Tabachnick and Fidell (2007), high collinearity exists when the tolerance coefficient is zero or close to zero. Menhard (1995) suggests that tolerance values below 0.2 are cause for concern.

In this study, both VIF and tolerance tests were undertaken for the regression model (Table 7.8). The results indicated that no variables were materially affected by multicollinearity.

Table 7.8
Test of Multicollinearity - Multivariate

Variable	Collinearity Statistics	
	Tolerance	VIF
LgSIZE	0.355	2.813
RecRR	0.637	1.569
RecETR	0.862	1.161
LgMKS	0.803	1.245
LgSHHLD	0.502	1.990

Note: Dependent Variable: LgENGRI

Multivariate Analysis

The ordinary least squares regression was conducted and the results are presented in Table 7.9. The results from the multiple regression show $R^2 = 41.1\%$, which indicates that the relationship between the independent variables (SIZE-company size and ETR-effective tax rate) and the dependent variable ENGRI (total voluntary environmental disclosure of GRI information) is statistically significant ($F = 33.79$; $P = 0.000$). Variable SIZE (company size) ($t = 6.886$, $p < 0.01$) is significant at the 0.01 level; variable ETR (effective tax rate) ($t = -2.118$, $p < 0.05$) is significant at the 0.05 level; Variables RR (rate of return on assets) ($t = -1.326$, $p < 0.10$) and SHHLD (number of shareholders) ($t = 1.359$, $p < 0.10$) are significant at the 0.10 level; and variable MKS (market share) ($t = 0.555$, $p > 0.05$) is not found to be significant. Variables SIZE

(company size), ETR (effective tax rate), MKS (market share) and SHHLD (number of shareholders) are all in the expected direction. Though variable RR (rate of return on assets) was found in the expected direction in the univariate statistical analysis, it is not in the expected direction in the multivariate analysis.

Table 7.9 (a)

Results from Multiple Regression

Model	R ²	F	Sig. (1-tailed)
Regression	0.411	33.79	0.000*

Note: Predictors: (Constant), LgSIZE, RecETR; * p < 0.05

Table 7.9 (b)

Results from Multiple Regression

Variable	Hypothesis	Expected Sign	B	Beta	T	Sig. (1-tailed)
LgSIZE	H ₁	+	0.257	0.565	6.886	0.000***
RecETR	H ₃	-	-0.446	-0.174	-2.118	0.0185**
RecRR	H ₂	+	-	-0.127	-1.326	0.0940*
LgSHHLD	H ₅	+	-	0.149	1.359	0.0885*
LgMKS	H ₄	+	-	0.048	0.555	0.2900

Note: N=100; * p < 0.10; ** p < 0.05; *** p < 0.01

Since variable ETR was inversed during data transformation, relationship between independent variable RecETR dependent variable ENGRI was expected to be negative;

Since direction of distribution for variable RR was reversed before data transformation, and variable RR was then inversed during transformation, relationship between independent variable RecRR and dependent variable ENGRI was still expected to be positive.

Discussion of Results

The results from this study indicate that certain variables from political cost theory are able to explain the level of voluntary environmental disclosure by Australian listed mineral mining companies in their annual reports, whilst other variables are less able to. The multiple regression analysis shows that variables SIZE (company size) and ETR (effective tax rate) are significant and both are in the expected sign. This indicates that the variables SIZE (company size) and ETR (effective tax rate) are positively associated with the dependent variable ENGRI (total voluntary environmental disclosure of GRI information). Hence, they can be used to explain the level of voluntary environmental

reporting. Consequently, hypotheses H₁ and H₃ are accepted. The other three variables, which are RR (rate of return on assets), SHHLD (number of shareholders) and MKS (market share), are found not to be significant. Nevertheless, RR (rate of return on assets) and SHHLD (number of shareholders) are moderately significant. Therefore, hypotheses H₂, H₄ and H₅ are rejected. All variables are in the expected sign except for RR (rate of return on assets).

Summary

This chapter has presented and elaborated the results of the tests developed to investigate the hypotheses formulated for voluntary environmental disclosure, based on the political cost theory. The next chapter will present summaries of chapters, the findings of this study, implications of the study as well as limitations to the study. Suggestions for further research will also be discussed in the next chapter.

CHAPTER 8

CONCLUSIONS

Summary

Chapter two presented the regulation review on environmental disclosure and explained reasons for choosing the Global Reporting Initiative (GRI) Sustainability Guidelines for this study. The chapter also covered the development of and current literature on the GRI guidelines.

Chapter three outlined a review of literature regarding the relevant studies on the extent, type and determinants of environmental reporting, in diverse industries, and specifically, in the mining industry. These studies reviewed were grouped into two categories: Non-GRI review and GRI review. The chapter also reviewed studies on the political cost framework. The review of literature helped the study to identify the specific industry, determine the theoretical framework, develop explanatory variables and formulate hypotheses.

Chapter four described the political cost framework and explained its relevance to the incidence of environmental disclosure. Based on the political cost framework and the review of literature, five directional hypotheses were formulated. These hypotheses were generated in terms of five explanatory variables, which were company size, rate of return on assets, effective tax return, market share and number of shareholders.

Chapter five discussed the research methodology employed for this study. It included the research design, population, sample selection, data collection and recording method, variables definitions, and data analysis approaches employed to achieve the research objectives identified in chapter one.

Chapters six and seven elaborated the results from data analysis. Chapter six presented the analysis of the changes in environmental reporting over 2007-2010, in terms of type and volume of information disclosed in the Australian mineral mining industry using the 2006 GRI Guidelines. Chapter seven presented the univariate and multivariate analysis to evaluate the association between the organisational political characteristics and the level of voluntary environmental disclosure within annual reports using political cost framework.

Findings of the Study

The results from descriptive analysis indicate that an increasing number of Australian listed mineral mining companies were disclosing environmental information in their annual reports, with an increase of 10% in the number of disclosing companies from 2007 to 2010. In 2010, 50 out of 100 sample companies disclosed environmental information in their annual reports. In addition, there was a constant rise in the total quantity of environmental disclosures during 2007 to 2010, with the increase during 2007 to 2008 being regarded as substantial. The reason for substantial growth during 2007 to 2008 and a slight increase during 2008 to 2010 may be the impact of the global financial crisis on Australia's economy.

Although there was a trend of constant rise in the total number of environmental disclosures from 2007 to 2010, it was found that the level (extent of reporting) of environmental disclosure in the Australian mineral mining industry was typically low, as companies only disclosed a narrow group of reporting elements from the GRI environmental performance indicators; the range of disclosures was around 10 from the total of 30 indicators during 2007 to 2008 and the average number of disclosures per company were close to one during the study period.

An increasing number of Australian listed mineral mining companies regarded "Overall", "Energy", "Water", "Emissions, Effluents, and Waste" and "Products and Services" as important categories in terms of environmental disclosure, as they were the four most common reported categories from 2007 to 2010. The reason why "Energy", "Emissions, Effluents, and Waste", "Overall" and "Water" were the most common categories could be that they are the most common concerns raised by the public, and companies prefer to disclose information that relates to the public's concerns.

Most sample companies (over 50%) preferred to disclose general environmental information in their annual reports rather than provide all relevant information as indicated in the GRI guidelines, and the quality of environmental disclosures is relatively low. This indicates that most of companies are still not willing to disclose their environmental issues in detail in their annual reports.

The results from univariate analysis indicate that all independent variables have an individual relationship with the independent variable (total voluntary environmental disclosure of GRI information), and all are positively associated. The variable rate of return on assets has a weak positive relationship with the dependent variable; the

variables effective tax rate and market share have a moderate positive relationship with the dependent variable; the variables company size and number of shareholders have a strong positive relationship with the dependent variable.

The results from ordinary least square regression indicate that certain variables from political cost theory are able to explain the level of voluntary environmental disclosure by Australian listed mineral mining companies in their annual reports, whilst other variables are less able to. The variables company size and effective tax rate are significant, and hence, are able to explain the level of voluntary environmental disclosure; both these variables are in the expected direction. These results indicate that company size and effective tax rate are positively associated with the level of environmental reporting. The remaining three variables, including rate of return on assets, market share, and number of shareholders, were not found to be highly significant. Nevertheless, rate of return on assets and number of shareholders are moderately significant. Except for the variable rate of return on assets, all variables are found to be in the expected direction.

Implications of the Findings

The findings of the study have implications for the users of annual reports, the preparers of annual reports, and the regulators of financial information in Australia. Users of annual reports are provided an insight into the extent of environmental disclosure in annual reports by the Australian listed mineral mining companies. They can use this information to guide their decision-making. They will now be also able to associate companies' political characteristics with the extent of environmental disclosure. The preparers of annual reports should also be encouraged to provide more environmental disclosures. The extent of environmental reporting should be improved rather than limited to a few indicators such as EN1, EN3, EN4, EN8, EN14, EN22, EN26 and EN30, which are described in full (a full description of these indicators is contained in Table 2.1 on pages 9-11). In addition, the preparers of annual reports should be encouraged to improve the quality of environmental disclosure. For the regulators of financial information in Australia, the findings of low level of environmental disclosure in annual reports by the Australian listed mineral mining companies indicate the need of an environmental reporting standard following the Global Reporting Initiative (GRI) G3 Guidelines. However, the results suggest difficulties in convincing all the Australian mineral mining companies to provide environmental disclosure in their annual reports.

In other words, the regulators may encounter opposition from the preparers of annual reports on the introduction of an environmental reporting standard. Hence, there might be a lengthy transaction period before the introduction of such a standard.

Limitations

The results of this study are subject to several limitations. Firstly, the study is limited to the Australian mineral mining industry. The results from this study may not be generic enough to be applicable to other industries. However, the Australian mineral mining industry is regarded as an important area to be assessed due to its environmental sensitivity and its significant contribution to Australia's economy. Secondly, the database is limited to the annual report. Hence stand-alone reports, website disclosures and media announcements did not form part of the study. However, the annual report is an important document produced by a company and it possesses a high degree of credibility. Thirdly, due to the time constraints and the extensive amount of information involved, the study is limited to the general mining operations. Consequently, specific studies relating to surface mining or underground mining were not considered; studies regarding environmentally sensitive locations and non-sensitive locations of Australian mineral mining companies were not identified either. However, these would be an extremely difficult task and may not be possible to undertake in all cases.

Suggestions for Future Research

The limitations of this study provide indications for future research in this area. Firstly, this study only investigated the Australian mineral mining industry and future research can be extended to include energy sectors, or other industries for comparison. Secondly, in order to evaluate overall environmental disclosure of companies, other media instruments such as stand-alone reports, website disclosures and media announcements could be investigated rather than focusing solely on annual reports; and other data collection methods such as interviews or questionnaires may also be undertaken. Thirdly, future researchers may also consider differences of environmental disclosure between surface mining and underground mining; and differences between companies within certain environmental sensitive locations and non-sensitive locations. Fourthly, future research on environmental disclosure can be conducted using a weighted or word count index instead of an unweighted dichotomous index. Finally, given the introduction of the GRI G3.1 Guidelines and the Mining and Metals Sector Supplement

Guidelines, future researchers may use the G3.1 Guidelines to guide their studies when researching in diverse industries and may use the Mining and Metals Sector Supplement Guidelines to guide their studies when only researching in the mineral mining industry.

In conclusion, this study extends prior research on environmental disclosure in Australia and contributes in two directions: first, the evaluation of changes in the extent of environmental disclosure in the Australian mineral mining industry using G3 Guidelines and second, the examination of the relationship between the level of environmental disclosure and corporate characteristics within the dimensions of political cost framework.

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Appendix A: Companies in the Sample

Number	ASX code	Company Name
1	ABU	ABM Resources NL
2	ADN	Adelaide Resources Limited
3	AGO	Atlas Iron Limited
4	AHN	Athena Resources Limited
5	AKI	African Iron Limited
6	AMX	Ampella Mining Limited
7	APG	Austpac Resources NL
8	ARH	Australasian Resources Limited
9	ASL	Ausdrill Limited
10	AUZ	Australian Mines Limited
11	AXM	Apex Minerals NL
12	AZH	Azimuth Resources Limited
13	BCD	BCD Resources NL
14	BGD	Boulder Steel Limited
15	BMG	Brazilian Metals Group Limited
16	BRD	Black Ridge Mining NL
17	BSM	Bass Metals Ltd
18	BYR	Burey Gold Limited
19	CCC	Continental Coal Limited
20	CDT	Castle Minerals Limited
21	CGM	Cougar Metals NL
22	CJO	Cerro Resources NL
23	CQT	Conquest Mining Limited
24	CRE	Crescent Gold Limited
25	CTO	Citigold Corporation Limited
26	CXM	Centrex Metals Limited
27	DDD	3D Resources Limited
28	DMA	Dynasty Metals Australia Limited
29	DTM	Dart Mining NL
30	ECM	East Coast Minerals NL
31	EME	Energy Metals Limited
32	ENT	Enterprise Metals Limited
33	EVG	Envirogold Limited
34	FML	Focus Minerals Limited
35	FRS	FerrAus Limited
36	FYI	FYI Resources Limited
37	GDN	Golden State Resources Limited
38	GIP	Gippsland Limited
39	GME	GME Resources Limited

Appendix A: Companies in the Sample (Cont'd.)

Number	ASX code	Company Name
40	GNI	Global Nickel Investment NI
41	GRR	Grange Resources Limited
42	GUL	Gullewa Limited
43	HAV	Havilah Resources NL
44	HHM	Hampton Hill Mining NL
45	HRR	Heron Resources Limited
46	IDM	Industrial Minerals Corporation Limited
47	III	Icon Resources Ltd
48	IPT	Impact Minerals Limited
49	ITT	Intermet Resources Limited
50	JML	Jabiru Metals Limited
51	KOR	Korab Resources Limited
52	KRL	Kangaroo Resources Limited
53	LBY	Liberty Resources Limited
54	LMG	Latrobe Magnesium Limited
55	LTR	Liontown Resources Limited
56	MAR	Malachite Resources Limited
57	MCR	Mincor Resources NL
58	MEP	Minotaur Exploration Limited
59	MGX	Mount Gibson Iron Limited
60	MLI	Mintails Limited
61	MNM	Mantle Mining Corporation Limited
62	MPJ	Mining Projects Group Limited
63	MTB	Mount Burgess Mining NL
64	MWN	Midwinter Resources NL
65	NAD	North Australian Diamonds Ltd
66	NGF	Norton Gold Fields Limited
67	NMR	Nimrodel Resources Limited
68	NTU	Northern Minerals Limited
69	ORD	Ord River Resources Limited
70	OVR	Overland Resources Limited
71	PCP	Paramount Mining Corporation Limited
72	PEN	Peninsula Energy Limited
73	PIR	Papillon Resources Limited
74	PNN	PepinNini Minerals Limited
75	PRW	Proto Resources & Investments Ltd
76	QMG	Quay Magnesium Limited
77	RAU	Republic Gold Limited
78	RDS	Redstone Resources Limited

Appendix A: Companies in the Sample (Cont'd.)

Number	ASX code	Company Name
79	RIM	Rimfire Pacific Mining NL
80	RMS	Ramelius Resources Limited
81	ROY	Royal Resources Limited
82	RSN	Renison Consolidated Mines NL
83	SAR	Saracen Mineral Holdings Limited
84	SDL	Sundance Resources Limited
85	SGM	Sims Metal Management Limited
86	SIR	Sirius Resources NL
87	SMM	Summit Resources Limited
88	SRE	Stirling Resources Limited
89	STB	South Boulder Mines Limited
90	SWN	Silver Swan Group Limited
91	TBR	Tribune Resources Limited
92	TKL	Traka Resources Limited
93	TPR	Timpetra Resources Limited
94	TTY	Territory Resources Limited
95	URM	Uramet Minerals Limited
96	VML	Vital Metals Limited
97	WCP	WCP Resources Limited
98	WGR	Westgold Resources Limited
99	WSA	Western Areas NL
100	ZGM	Zamia Metals Limited